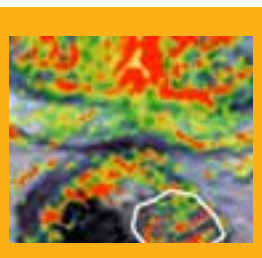
ECR TODAY 2013

DAILY NEWS FROM EUROPE'S LEADING IMAGING CONGRESS

Friday 8 March 2013



Collaboration between nuclear medicine, radiation oncology and radiology can enhance prospects of cancer patients

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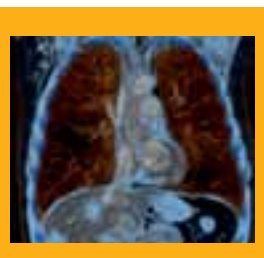

CT vendors focus on iterative reconstruction and cardiac applications in their research and development efforts

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Opening Ceremony: José I. Bilbao, George S. Bisset, Diane Glazer, Tarek A. El-Diasty, Gabriel P. Krestin

Warning: staff with prosthetic devices might not be as safe as patients

By Becky McCall

Some prosthetic devices that pass as MR-compatible for patients may not be safe for radiographers and nurses, according to a presentation at yesterday's scientific session dedicated to safety in MRI.

Dr. Nadia Oberhofer, from the medical physics department at Bolzano Hospital, South Tyrol, Italy, came to this conclusion after an investigation was triggered by the case of a nurse in the anaesthetics department who experienced pain in her ear whilst rushing towards a patient in need of help within the MRI system. Her pain persisted for a week. A month before the incident, the nurse had had a stapes prosthesis implant.

"As the nurse rushed forward and placed her head inside the bore, she experienced pain, which she described as similar to a rubber band going 'ping'," Oberhofer reported to a fascinated audience.

The otologic prosthesis was a SMart Stapes Piston made from fluoroplastic plus nitinol, which is a non-ferromagnetic, nickel-titanium alloy. This alloy has a magnetic susceptibility considered to be less than pure titanium.

The case highlights the question of whether there was a need for additional safety information for staff. The nurse had been told that her implant was safe by the lead physician, so she had not requested an additional safety assessment. For non-MR personnel, Bolzano Hospital currently carries out an annual safety check.

Curious as to why the nurse experienced such pain, and what medical physicists could do in such a situation, Oberhofer examined the literature and appropriate websites. The results were mixed. She found that www.mrisafety.com listed the device as safe, and a paper examining titanium middle ear implants in a 3 Tesla MR unit also considered them to be safe, with respect to the patient. There was no mention of prostheses in staff.

She also noted that another search revealed some implantable otologic devices were only safe under certain circumstances, as specified by the manufacturer. Her search revealed that Olympus states that nitinol Smart Stapes Piston technology implants are safe in machines of up to 3 Tesla.

Oberhofer showed a recording of a film demonstrating what happens when a prosthetic device moves slowly through a magnetic bore at a rate of 2 cm/sec; it turns through 70 degrees, and then returns to its original position as it slowly exits the bore.

"But if a non-ferromagnetic metal device enters the bore quickly, at a rate of around 100 cm/sec, then it flips around quickly," she explained. "It is subject to Lenz' law, which says any metallic object which experiences a difference in magnetic flux dFB is subjected to an opponent force."

Effectively, devices in the patient are associated with a slow introduction into the bore, but workers have different conditions often showing vertical movement and even rotational movement of the head.

Oberhofer thinks manufacturers should provide a risk assessment for workers as well as patients regarding non-ferromagnetic implants. "Even if scanning with these devices is permitted for the patients, personnel might not be permitted to enter the MR-examination room near the gantry," she said.

Session moderator Prof. Oliver Speck, from the University of Magdeburg in Germany, pointed out that the presentation was related to the EMF Directive, which is designed to protect workers from electromagnetic fields.

"Personnel were not operating under the same circumstances as patients and radiologists must instruct their staff to this end. People need to stay calm as in any emergency situation and this might be the solution," he said.

Nadia Oberhofer from Bolzano, Italy.

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Debate ignites over breast MRI's added value

By Philip Ward

It was every speaker's nightmare. When Dr. Laura Merckel sat down after presenting at yesterday's breast scientific session, her findings were challenged instantly by a member of the audience.

Merckel, from the University Medical Center Utrecht in the Netherlands, found that 3T breast MRI of mammographically detected microcalcifications is of added diagnostic value, but only by expert radiologists. In experienced hands, the technique has high sensitivity for the detection of in situ (> 75%) and invasive cancer (100%) in patients with microcalcifications on mammography, she added.

However, Dr. Clemens Kaiser, a radiologist from the Mannheim Medical Faculty at the University of Heidelberg in Germany, thought the results were highly questionable.

"It's 2013 and the added value of MR mammography today is pretty clear. There are over 1,000 papers out there about the sensitivity and specificity of MR," he said. "Obviously you miss a lot of DCIS (ductal carcinoma in situ) cases. There are so many signs that help you to decide whether it's DCIS or not."

Kaiser asked Merckel to define what she meant by an 'expert reader'. She said that in her study, the expert was a medical doctor with a PhD in breast MRI and extensive research experience. She also noted that regrettably no attempt was made either to compare 1.5T and 3T or to look at diffusion-weighted imaging. Furthermore, only diagnostic performance (not therapeutic performance) was considered, and multifocality was not taken into account.

The Utrecht group studied 141 patients with microcalcifications who underwent contrast-enhanced 3T breast MRI before undergoing breast biopsy. A total of 52 of the 141 lesions (37%) turned out to be malignant, and 30 patients had pure DCIS and 22 had mixed or pure invasive breast cancer.

In the same session, researchers from the University of Vienna explained why multiparametric 3T MRI of the breast with BI-RADS-adapted reading can improve diagnostic accuracy, when based on established reporting guidelines.

"BI-RADS-adapted reading is fast and easy to use in clinical routine," said Dr. Katja Pinker-Domenig, an associate professor of radiology. "BI-RADS-adapted reading is robust to intra- and inter-reader variability."

However, no standardised technique currently exists for how to combine the assessment of the morphological, functional and molecular information from contrast-enhanced MRI and diffusion-weighted imaging (DWI). To optimise the accuracy of multiparametric MRI of the breast with contrast-enhanced MRI and DWI, it is vital to develop a method that efficiently combines the diagnostic information and to maximise specificity without compromising sensitivity, she said.


Katja Pinker-Domenig from Vienna, Austria.


Laura Merckel from Utrecht, the Netherlands.

Therefore, the Vienna team have sought to develop a combined reading for contrast-enhanced MRI and DWI adapted to the BI-RADS for multiparametric MRI of the breast at 3T. They also aimed to assess its diagnostic value, inter- and intra-reader variability.

Global radiologist shows the way forward in musculoskeletal trauma cases

By Becky McCall

Go back to basic anatomy and mechanism of injury to understand which structures could possibly be injured in a particular scenario. That was the overriding message of a leading musculoskeletal (MSK) radiologist in yesterday's lunchtime session on trauma.

Born in Lebanon and of Armenian origin, Dr. Ara Kassarjian trained at Harvard University Medical School, the US, and now works as consultant radiologist in Corades, S.L., Madrid, Spain. Speaking in a room bursting at the seams with audience members keen to learn from his wide experience, he focused on joints in acute trauma and the best ways to image and interpret the scans with various modalities.

"Importantly, my main message is that when you see an injury you need to know what the other associated injuries might be so you know to look for them," he remarked. "If you don't look for them specifically then you won't see them."

He added that if you know what to expect then you can focus in on the situation in hand, specifically the mechanism of injury. "If the scan you already have is not sufficient then you need to know which imaging modality to move on to next. When the imaging and clinical scenario don't match, as is often the case, it's important to know what to look for."

Kassarjian's talk took the listeners on a journey through typical musculoskeletal injuries that a general radiologist might come across from upper to lower extremities pointing out possible injuries that might easily be missed.

One of the most common injuries seen by generalists is the anterior cruciate ligament (ACL) injury often seen in skiers and footballers. "After a radiologist has made a diagnosis of the ACL tear, the associated meniscal injury and maybe a medial collateral meniscus injury, as well as bone contusions due to the mechanism, they always have to look at the posterolateral corner and the posteromedial corner specifically because injuries to these structures will alter outcomes if they are not addressed at surgery," Kassarjian warned.

Driving the point home, Kassarjian added that a general radiologist might not know the names of all the ligaments and structures in the posterolateral corner but they should be aware that there is a need to look for injury there. He added that if oedema and distortion of the anatomy is found then a radiologist needs to raise the possibility of posterolateral injury.

"Get the textbook and look up the ligaments there, and if you can't actually see them then they are probably injured," he asserted.

"Even if a radiologist does a great job of diagnosing the ACL injury and the meniscal injury, if you miss the posterolateral corner injury and the patient is operated on to repair the ACL, they may still have an unstable knee post-operatively leading to a worse prognosis."

Kassarjian's experience extends from common everyday sports injuries to those experienced by elite athletes in major sporting events in Boston and Spain and professional tennis players on tour. He is Tournament Staff Physician for Madrid Open Tennis. "When you work with elite athletes, you need to know all the basic information, mechanisms and lesions but to a greater level of detail because different activities have different sports-specific injuries. You need to know the sport to understand the significance of the lesion."

In his take home message, Kassarjian highlighted that instead of trying to memorise all the fine detail, radiologists should go back to basic anatomy and the mechanism of injury to help explain the structures that are most likely to be injured in any particular case.


Ara Kassarjian from Madrid, Spain.

"Musculoskeletal injury is all about anatomy. With MRI we see a lot more anatomy than we saw in medical school so you have to go back and learn the details if you want to read these scans."

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Miquel Barceló | 1/2 T et son jus, 2010 | © Courtesy Miquel Barceló

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Prieto elaborates on gene therapy's vast untapped potential

By Philip Ward

A small but significant glimpse into the highly promising and fast-emerging world of gene therapy was provided during Thursday's opening ceremony.

Gene therapy can now be applied to treat a wide variety of human conditions, and liver-directed gene therapy in particular is being used to treat hereditary monogenic diseases, primary and metastatic liver cancer and liver cirrhosis, according to Prof. Jesús Prieto, professor of medicine and director of the department of hepatology and gene therapy at the Centre for Applied Medical Research at the University of Navarra, Spain.

Opening Lecturer Jesús Prieto from Navarra, Spain.

Among the diversity of monogenic conditions amenable to liver-directed gene therapy are acute intermittent porphyria, Crigler-Najjar syndrome, progressive intrahepatic cholestasis, urea cycle disorders, haemophilia A and B, Wilson's disease, glycogen storage diseases, hyperoxaluria, and lysosomal storage diseases.

Prieto and his colleagues have produced a long-term expression vector encoding insulin-like growth factor 1 (IGF-1), and have tested it in a model of liver cirrhosis in rats that had been subjected to CCL4 intoxication for eight weeks. A low dose of the vector was administered through the hepatic artery. They observed that the levels of IGF-I increased in cirrhotic livers treated with the vector compared to cirrhotic livers given saline (Ci) or cirrhotic livers treated with a vector encoding a neutral reporter gene (Luc). They deduced that IGF-I gene therapy can induce a tissue repair response leading to a genuine organ remodelling of the cirrhotic liver.

In the organisation of tissue, homeostasis is critical to the interaction between hepatocytes and auxiliary cells, which in the liver are mainly represented by hepatic stellate cells and Kupffer cells. Hepatocytes release IGF-I, the receptor of which is in the auxiliary cells. In response to IGF-I, auxiliary cells release hepatocyte growth factor (HGF), which displays cytoprotective and trophic functions on hepatocytes, explained Prieto.

In liver cirrhosis, the agent causing liver damage – but also the reduced availability of IGF-I due to hepatocellular insufficiency – promotes inflammation and scar formation. The lack of IGF-I signalling is seemingly interpreted by the auxiliary cell as an absence of parenchymal cells, and this stimulates the production of collagen to fill the empty space with scar tissue, he said.

Restoration of IGF-I signalling stimulates the production of HGF, with reduced apoptosis, attenuation of inflammation, decreased fibrogenesis, increased metaloprotease activity and tissue regeneration, leading to cirrhosis regression.

In the human cirrhotic livers, sinusoids become capilarised, and this reduces their permeability to gene therapy vectors, noted Prieto. For the transduction of cirrhotic livers, the vector would be better administered by the transjugular route in order to be injected under pressure in the suprahepatic vein radicles by inflating a balloon proximal to the tip of the catheter. Moving the catheter from one segment to another, the interventional radiologist can make a 'genuine molecular tattooing of the liver', an approach that may have a role in the future therapy of liver cirrhosis, he suggested.

Also, in cirrhotic livers with implanted tumour nodules, it may be possible to transduce the tumour by percutaneous injection under echographic guidance with a vector encoding for instance an immunostimulatory molecule in combination with transduction of the peritumour tissue by the transjugular route, with a vector encoding, for instance, an antiangiogenic molecule. This is an example of the flexibility of gene therapy, which is in essence a sort of molecular surgery, according to Prieto.

In December 2012, the Navarra researchers began a phase I/II clinical trial in four cohorts of two patients, each with increasing doses of adeno-associated virus type 5 (AAV5) encoding porphobilinogen deaminase (PBGD). So far, they have treated the four patients corresponding to the first two vector doses, and tolerance was excellent. No biochemical data are available yet, but an improvement in the patients' symptoms has been reported.

At the end of his lecture, Prieto acknowledged the contribution of his colleagues at the University Clinic of Navarra and the Centre for Applied Medical Research of the University of Navarra.

Proper training of radiology technicians can lead to significant reductions in dose

By Mélisande Rouger

Experts underlined the role of training staff in radiation protection during yesterday's radiography session, 'Importance of Education in Practice'. Iterative reconstruction now enables technologists to significantly reduce dose, but there are other simpler ways to do so, and one of the most important is proper training.

The use of fluoroscopy-guided procedures has increased in operating theatres throughout many countries including Finland, but the use of radiation has not been systematically studied before, according to Anja Henner, a radiographer from the Applied Science University of Oulu, who spoke during the session. She presented the results of a study conducted in 2012 by the University of Oulu and the Radiation and Nuclear Safety Authority Finland (STUK), which tackled issues of radiation use and protection, as well as staff training. The results revealed that radiation protection training remains inadequate.

"The right way to use the radiation dosimeter is not clearly understood in all operating theatre units and staff skills are inadequate for optimising patient dose," said Henner.

Aprons and thyroid shields are available in every operating theatre, but as many as 19% of staff members do not wear protective shields during procedures, the study showed. Lead shields for patients were used in only 58% of cases. "There is a lack of basic training and updating of training, and only a few operating theatre units employ staff with adequate training in radiation protection. Staff skills to optimise the dose to the patient and themselves are generally inadequate," she said.

Some situations are particularly prone to cause uncertainty, and radiation protection for children is probably one of the situations most likely to cause confusion. "Staff members feel that they are not sufficiently trained and they want to have more information about it," Henner said. A faulty C-arm and lack of time for surgeons were also identified as obstacles to choosing the right mAs- and kV-values or programmes.

The use of radiation in operating theatres in Finland needs improvement, Henner concluded, but it may take time before they are visible in clinical practice. "We need a certain amount of evidence and we may need another five years to get it. Staff are more interested in radiation protection nowadays than ten years ago, so awareness is growing. But unfortunately, there is also a lack of interest from many clinics," she said.

Dr. Teun Pappot, a third-year resident in radiology at Rijnstate Hospital in Arnhem, the Netherlands, spoke about dose reduction in computer tomography. He stressed the importance of basic training for technologists, particularly for images beyond the intended anatomic area of interest.

"There were over 100 CT dose reduction publications in 2012 but none on scan volume. When other parameters are held constant, the radiation dose is proportional to the scan volume, so it is important to scan within the anatomic boundaries and reduce extra images," he said.

Pappot and his colleague Milan Pijl evaluated body CT scans over two 4-week periods, one before and one after 10 minutes of technologist training. Technologists and radiology residents were made aware of dose issues arising from images beyond the boundaries as prescribed in protocols. Dose-length product (DLP), the total number of reconstructed images and the number of cranial and caudal images of the prescribed protocol were noted; pathological findings in extra anatomic images were also noted.

Anja Henner from Oulu, Finland.

Teun Pappot from Arnhem, the Netherlands.

They found that in 8 out of the 571 scans the extra slides revealed additional findings like a renal cyst, but none of them were of clinical significance. Furthermore, there were no significant statistical differences between both periods in terms of patient characteristics or scan type. The median numbers of effective images before and after training were equal and the median effective DLP was similar. But the median number of extra images per scan decreased 53% from 15 prior to training and six after training ($p<.001$). The extra DLP decreased by 50% accordingly ($p<.001$).

"Brief and simple technician training can result in a significant decrease in extra anatomic images in body CT, and an absolute dose reduction of 5.2%, without correcting for dose modulation," he concluded.

ECR adds more young guns to its team

By Mélisande Rouger

"I am very happy to be here, to be able to meet so many people," said Christian Jell with a sunny smile. He is one of the first people delegates meet when they arrive at the Austria Center Vienna. This role seems tailor-made for him, and delegates can't help but notice and smile back at his cheerful attitude when he hands out copies of *ECR Today*. Not far from him, Elisabeth Bisrak looks equally pleased despite the early hour. "We started our shift at seven this morning and we will be here until one o'clock, until our colleagues replace us. But we will be back on Monday morning first thing!," she declared enthusiastically. Both are employed by Youth at Work (Jugend Am Werk), a non-profit Viennese organisation which helps young people and people with intellectual disabilities find employment. Jell and Bisrak are in charge of handing out the paper, but some of their colleagues also distribute apples around the ACV. When they are not working at the ECR, they bake Apfelstrudel and all sorts of cakes, as well as savoury spreads and sandwiches for the organisation's own coffee house. Youth at Work provides services to many companies and individuals in Vienna. As well as providing its services during ECR 2013, Youth at Work has been working with the European Society of Radiology for the past year and a half. Founded in 1945, Youth at Work trains 1,700 young men and women, each year, who have been unable to find an apprenticeship in the job market, allowing them to live as independently as possible. The organisation offers a wide range of courses for vocational training and qualifications in a large number of professions – from catering to laundry and message delivery – with the aim of helping young people and people with intellectual disabilities find gainful employment. It also provides housing based on individual needs.

Please visit the website of Youth at Work (in German) for more information: www.jaw.at

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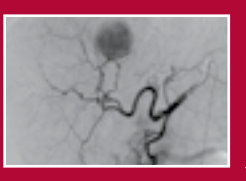

Endovascular procedures in HCC treatment
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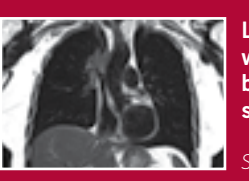

Lung MRI gradually wins over sceptics, but 'prejudice' must still be overcome
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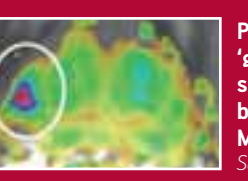

Prepare for the 'global paradigm shift' initiated by prostate MR imaging
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Collaboration between nuclear medicine, radiation oncology and radiology can enhance prospects of cancer patients

By Becky McCall

Promoting more effective collaboration between radiologists, nuclear medicine physicians and radiation oncologists to improve imaging and radiotherapy outcomes is a core principle underpinning the lectures in today's Special Focus Session on 'Imaging and radiotherapy: all you need to know'.

Amongst the speakers sharing their valuable experience and opinions will be Dr. Annika Loft, chief physician from the department of clinical physiology, nuclear medicine and PET, Rigshospitalet, Copenhagen University Hospital, Denmark, and Prof. Regina Beets-Tan, oncological and abdominal radiologist from Maastricht University Hospital and Oncology Center, the Netherlands, who will discuss the importance of collaboration with radiation oncologists.

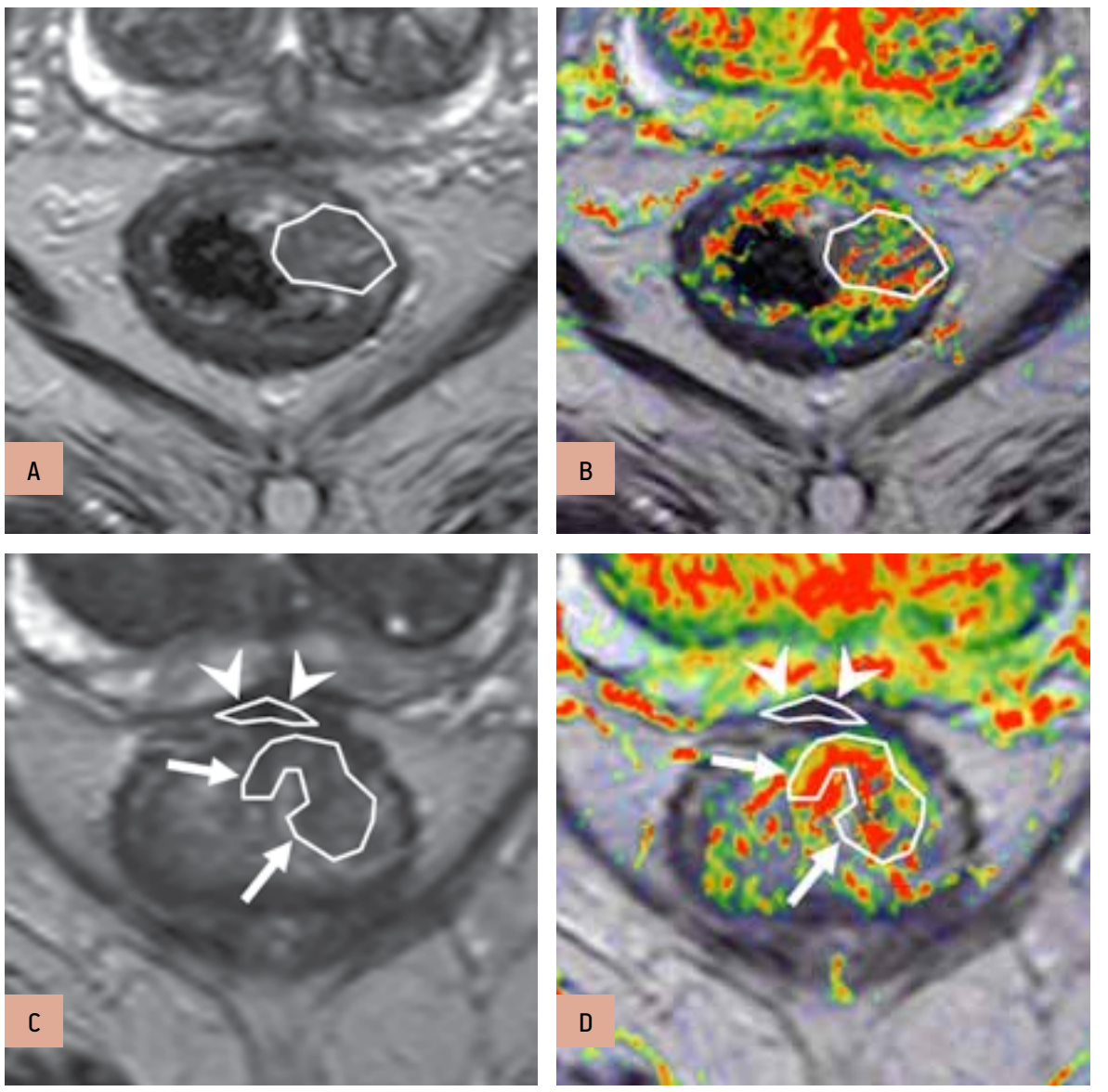
Beets-Tan will take attendees on a journey through the future of oncologic imaging by addressing how new imaging biomarkers that highlight tumour heterogeneity can help radiation oncologists plan therapy. In an interview with *ECR Today,* she pointed out that radiologists have increasing value to radiation oncology, because of rapid advances in the approach to dose distribution radiotherapy that require a combined professional approach.

"They need us to guide their treatment," she remarked. "You will hear from my co-lecturers in radiation oncology, Prof. Vincenzo Valentini and Prof. Karin Haustermans, about intensity-modulated radiation therapy and 'dose painting', new ways to irradiate patients and to shape the dose distribution to the differences in radiobiology across tumours. Higher doses are given to certain tumour areas that are more radioresistant, the so-called 'target within a target', while sparing as much normal tissue as possible from damage."

Dose shaping gives rise to a need for ever more accurate imaging that identifies a tumour's heterogeneity and for imaging to evaluate response both during and after radiotherapy. Radiation oncologists want to know from radiologists which regions in the tumour are more resistant to their treatment and how these regions are responding during the radiation treatment so that the dose can be adapted, stated Beets-Tan.

Size alone is inefficient as a radiotherapy response evaluation tool because it can mislead at times and is less accurate than functional and metabolic imaging, and she thinks PET and MRI have capabilities to offer improved imaging in this respect. MRI has the advantage of showing a high resolution of morphology, but also functional imaging of tumour biology and behaviour, she pointed out.

Imaging biomarkers, in particular, can provide an objective measure of pathophysiological processes.



Perfusion MRI of a rectal tumour compared with histology. A: T2-weighted MR image of a patient with rectal tumour (encircled) before chemoradiotherapy. B: corresponding perfusion MR image (K-trans map). There is a heterogeneity in tumour angiogenic activity with areas of higher (red) and lower K-trans values. C: T2-weighted MR image of the same patient after irradiation of the tumour. D: corresponding perfusion MR image (K-trans map). Residual tumour (white arrows) is visualised, showing persistent heterogeneous angiogenic activity with areas of high (red) and low K-trans values (arrowheads pointing at fibrosis in the anterior rectal wall).

"This is why I think the future of MR imaging will involve diffusion, perfusion, proliferation and further into the future still, hypoxia and automated image segmentation," said Beets-Tan. "This is where we radiologists will have a significant role in our collaboration with radiation oncologists."

However, she emphasised that before these biomarkers can be used in imaging practice, validation of the techniques is required to confirm whether 'what you see is also what you get'. Ultimately, in the multicentre setting, protocol standardisation and implementation are needed to enable large patient cohort validation.

"After this, we would need to implement the techniques and incorporate them into clinical outcome trials," she said. "Treatment stratification in clinical trials based on imaging biomarkers will have to show whether the use of these will also lead to significant improvement in the quality and survival of patients. If we prove that, then imaging biomarkers will be ready for clinical practice."

Beets-Tan and her colleagues have validated functional MRI of the tumour and nodes in their own centre, and are currently performing a multicentre study expanding participation to another 10 centres in the Netherlands. There has also been interest from other European countries and the U.S. to participate in the research.

Adding further emphasis to the value of smooth collaboration between nuclear medicine physicians, radiation oncologists and radiologists in her presentation, Loft plans to highlight that using PET-CT for radiotherapy planning requires a more multidisciplinary approach. Reflecting on her experience, she pointed out that in some hospitals, nuclear medicine physicians only performed the clinical diagnostic reading and exported the data to the oncologist who defined the tumour.

"These clinicians are not trained for this, so it can be quite difficult sometimes. It can lead to misinterpretation and there's a risk of FDG-avid foci being included in the target volume, even though they are not malignant. I would like to keep the expertise with the expert," she said.

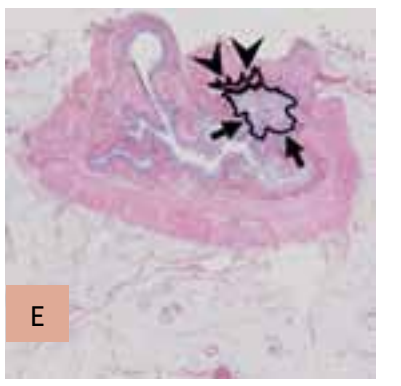
Ideally, a nuclear physician together with a radiologist should define what is malignant on the PET-CT scan. According to Loft, the oncologist is the expert in actually treating the patient and devising an individual treatment plan.

PET-CT provides the functional information of PET with the anatomical imaging of CT and Loft points out that the combination helps with planning the volume for radiotherapy.

"You might find lymph nodes that are too small to be defined as malignant on CT, but are definitely malignant on PET because of FDG uptake, so planning volume would increase. Conversely, planning volume would decrease if nodes are suspicious on CT but definitely look non-malignant on PET," she noted.

In her talk, Loft will turn her attention to misreading of scans and reducing false positives. She will show clinical examples of how to increase and decrease the treatable tumour volume. A PET scan of lung cancer with potential lymph nodes involvement is a typical example of where misreading can occur.

"Somebody with little experience might think the lymph nodes need to be included in the total volume, but an experienced nuclear physician would determine whether they look positive or malignant, and if not, then they should not be included," she explained.



E: Histopathology confirmed the areas of residual tumour (arrows) and fibrosis (arrowheads). (All images provided by Prof. Regina Beets-Tan)

"An oncologist might include them to be sure nothing is missed, but then the patient has a large tumour volume for treatment and this increases the radiation exposure and potential complications for the patient."

Conversely, compared to an oncologist, a nuclear medicine physician might also see bone metastases or affected lymph nodes that the oncologist might not notice. According to Loft, it is mainly a judgment of whether the FDG-avid foci are malignant or not. "Only experience can enable one to know the differences between malignant and non-malignant foci for as long as we do not have a tracer for malignancy. There's no recipe for this," she said.

Addressing patient preparation is Loft's final issue. Most importantly, patients need to be precisely positioned in the same way for radiotherapy planning as for radiotherapy itself. "The patient needs to be in the exact same position for PET-CT scanning as for treatment, and this requires a lot of markings to define the exact location of the tumour. It's not enough to put up the PET-CT scanner and scan!"

Special Focus Session
Friday, March 8, 16:00–17:30, Room F2
SF 7b: Imaging and radiotherapy: all you need to know

- **Chairman's introduction**
  V.J. Goh; London/UK
- **Modern radiotherapy: what are the new technologies?**
  V. Valentini; Rome/IT
- **PET/CT for radiotherapy planning: how does it assist IMRT?**
  A. Loft; Copenhagen/DK
- **Response evaluation and treatment adaptation**
  K. Haustermans; Leuven/BE
- **MR imaging biomarkers for response evaluation**
  R.G.H. Beets-Tan; Maastricht/NL
- **Panel discussion: How can imaging improve outcomes in radiotherapy?**

#SF7b #ECR2013F2

Endovascular procedures in HCC treatment

By David Zizka

There are a wide range of treatment options available when dealing with hepatocellular carcinoma (HCC), ranging from interventional and endovascular procedures to surgical interventions such as liver transplantation. The main reason for performing endovascular procedures when treating patients with hepatocellular carcinoma is the fact that liver neovascular networks are nourished exclusively by the arteries.

Liver tumours, both primary and metastatic, are almost entirely supplied by branches known as neo-vessels, which originate in the hepatic arteries. The surrounding peritumoural liver parenchyma is vascularised mainly by portal vein branches. When an HCC is larger than two centimetres in diameter the afferent vessel can be identified and then targeted via an arterial endovascular approach. These unique characteristics – dual vascular supply and the ability to identify the afferent vessels – are the rationale behind the use of endovascular treatments, and several different techniques have been developed over the last 30 years. Among the most frequently used are the infusion of chemotherapy and the introduction of particles, either as occluding devices or as carriers of an active agent, which attacks the tumoural cells and surrounding neovessels.

In general these procedures can be classified into three major groups: embolisation (TAE – Transarterial Embolisation), Chemoembolisation (TACE – Transarterial Chemoembolisation) and radioembolisation (TARE – Transarterial Radioembolisation).

Sometimes comparing their efficacy can be difficult, but in spite of this, a vast amount of scientific research has provided robust evidence to support the application of these endovascular techniques in patients with HCC. The best method and the appropriate subgroup of patients, remain hotly contested issues.

The interventional term embolisation refers to many different procedures. They are based on the introduction of particles that occlude the selected vessel. In liver tumours their immediate effect is ischaemia, which provokes extensive coagulative necrosis of the targeted tissue but also comes with a well-known side effect.

"The remaining, still viable, cells that survive the ischemic effect can trigger a strong pro-angiogenic mechanism through which the tumour may try to recover its pre-embolisation environment. So, the ischaemia provoked by embolisation has a proven therapeutic effect (necrosis) but also a well-known side effect, which is neo-angiogenesis, that can facilitate tumoural relapse," said Professor José Ignacio Bilbao, ECR 2013 President, from the department of radiology at the Clínica Universitaria de Navarra in Pamplona, Spain.

Avoiding damage to the surrounding areas is of the utmost importance when 'targeting' the tumoural vessels. Targeting should be interpreted with two 'optics'. There is the macroscopic method, through which all the vessels, intra and extra-hepatic, that feed the tumour are selected using a microcatheter and then the treatment is administered through them. There is also the microscopic method, in which the particle (or the active principle) is delivered as close as possible to the tumoural cells. In the case of embolisation with particles, if they are too big they may stray too far from the tumour resulting in lower necrotic/ischaemic effect and no effect on the intratumoural neovascular network.

"It is, at this moment, important to remember that in most of the HCC cases the non-tumoural liver tissue is not a healthy parenchyma and that any damage to the hepatocytes, the sinusoids or bile ducts may have severe consequences. In summary, these are the main reasons why selectivity in the treatment, widely understood, is so important in the endovascular treatment of HCC," Prof. Bilbao pointed out.

Endovascular methods may also be used for the superselective deployment of anticancer agents for a durable occlusive effect, also known as the macroembolic effect, which is used to bring about tumoural ischaemia. There are also some other particles that are used to transport anticancer agents through the microvessels within or surrounding the tumoural nodules.

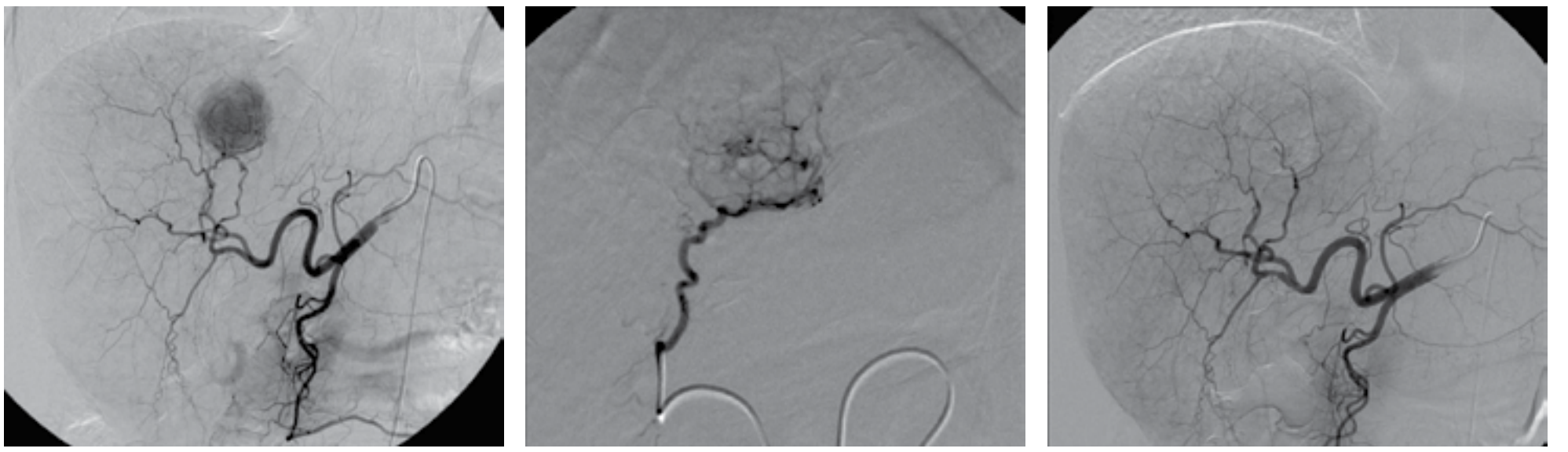
"Any transient decrease in the arterial flow, known as a microembolic effect, will not provoke any ischaemia. For example, when radioembolisation is applied, the antitumoural effect is exclusively obtained by radiation, which needs cell oxygenation (absence of ischaemia). The therapeutic effect given by the two main modalities (resin and glass), irrespective of the amount of particles deployed, is based on the delivery of Yttium-90 as close as possible to the tumoural cells," said Prof. Bilbao.

There are new therapeutic approaches that vehiculise agents (such as pyruvate analogues) and target the metabolism of cancer cells. In theory, by using this approach the vehiculising device will not provoke any ischaemia and the agent will only be active within the tumoural cells.

Asked if there are any recent or future developments that seem promising for the treatment of hepatocellular cancer, Prof. Bilbao pointed to the use of antiangiogenic drugs. Sorafenib, and other antiangiogenic drugs, have demonstrated their efficacy, in terms of increasing responses and survival in patients with advanced HCC. There are several ongoing studies, some of which will be published soon, that have explored a possible combination of antiangiogenic drugs with endovascular treatments (chemoembolisation and radioembolisation) in non-surgical HCC cases. The reason behind this approach is that antiangiogenic drugs may decrease the neoangiogenic effect triggered by endovascular procedures. Some questions still remain unanswered; among them is whether antiangiogenic drugs should be administered before, during or after TACE and TARE.

Dr. Alberto Benito from the Clínica Universitaria de Navarra in Pamplona, who will also give a speech during the session on HCC, clarified that some uncommon radiological patterns can be seen after the use of Sorafenib, which could cause some confusion: "Sorafenib is a new drug, a multikinase inhibitor, which has improved the survival of patients with advanced stage HCC. It works as an antiproliferative and antiangiogenic drug, so one should expect a decrease in tumoural hypervascularisation with a delay in progression and an increase in survival after treatment. Although there are still no validated criteria to assess Sorafenib efficacy, functional techniques such as perfusion CT/MR or diffusion MRI, and new approaches such as the recently proposed mRECIST guidelines may be useful to evaluate patients with HCC in the near future."

Overall the session will focus on the current management of HCC as laid out in the scientific guidelines and it will also cover the importance of a multidisciplinary approach in ensuring patients get the best treatment available. Lectures on hepatocellular carcinoma from surgical and oncologic perspectives will be given by Dr. Fernando Pardo and Prof. Bruno Sangro, both from the Clínica Universitaria de Navarra in Pamplona.



Three very basic images that show an illustrative case in which a tumour is clearly seen within the liver, the microcatheter is in the afferent artery, a bland embolisation was performed. The final angiography does not show any hypervascularity. (Provided by Prof. José I. Bilbao)

Multidisciplinary Session: Managing Patients with Cancer

Friday, March 8, 08:30–10:00, Room F1

MS 4: Hepatocellular carcinoma

- **Chairman's introduction**
  B. Sangro; Pamplona/ES
- **Abdominal radiology**
  A. Benito; Pamplona/ES
- **Interventional radiology**
  J.I. Bilbao; Pamplona/ES
- **Surgery**
  F. Pardo; Pamplona/ES
- **Hepatology/oncology**
  B. Sangro; Pamplona/ES
- **Case presentation and discussion**

#MS4 #ECR2013F1

EPOS Discussions

To enhance interaction, discussions on hot topics in radiology have been arranged, where authors of the selected and best-scored posters in each field will discuss them with a moderator.

All discussions take place in the EPOS™ Area in Foyer A (2nd level) and ECR delegates are welcome to join, listen, and discuss with the experts. The discussion rounds will be:

Friday, March 8, 10:00–10:30
Imaging of the scrotum: why considering MRI?
Moderator: Lorenzo E. Derchi; Genoa/IT

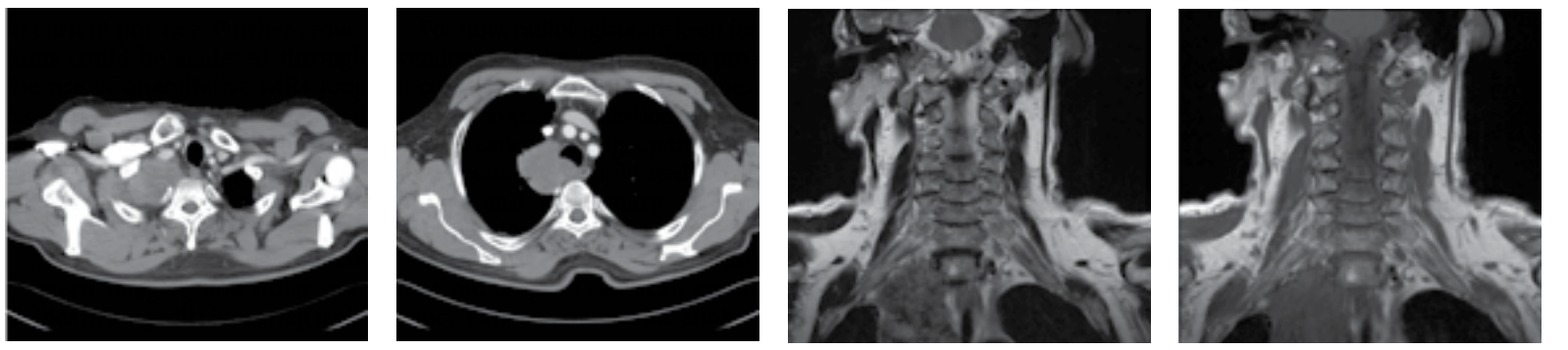
Friday, March 8, 12:30–13:00
Paediatric neuroimaging
Moderator: Andrea Rossi; Genoa/IT

Friday, March 8, 15:30–16:00
Plaque imaging and myocardial characterisation
Moderator: Valentin Sinitsyn; Moscow/RU

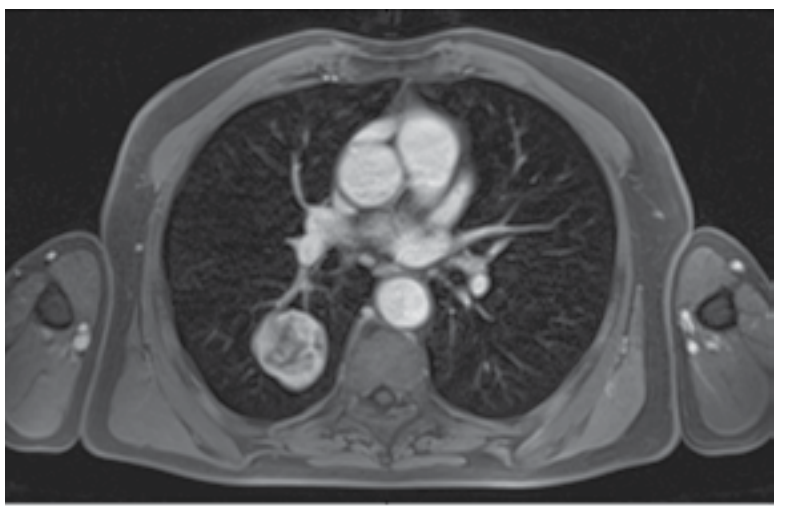
Lung MRI gradually wins over sceptics, but 'prejudice' must still be overcome

By Frances Rylands-Monk

Lung MRI is now benefitting from faster sequences than ever before, as well as standardised approaches on some scanners, and proponents of the technique are working hard to boost its wider use and acceptance in clinical practice. They point to its ever increasing list of indications and novel developments underway, stressing that MRI can downstage cancer and make previously inoperable patients operable.



Superior sulcus tumour on axial CT, with coronal MRI images giving insight into invasion of critical structures in mediastinum, subclavian vessels and brachial plexus. (Provided by Prof. Edwin van Beek)



77-year-old male patient with adenocarcinoma in segment 6 of the right lower lung lobe (transverse contrast-enhanced breath hold 3D gradient echo study). (Provided by Prof. Edwin van Beek)

Often regarded as the 'weakest link' in whole-torso MRI, however, prejudice still needs to be overcome.

"Our job is to show on a case-by-case basis – depending on the primary tumour and quality of the lung protocol – that whole-torso staging analysis of the lung by MRI is at least as good as CT or even PET-CT," said Prof. Hans-Ulrich Kauczor, medical director and chairman of radiology, Department of Diagnostic and Interventional Radiology, University Hospital of Heidelberg, Germany. "Basic lung protocols are as easy to perform as MRI of the knee or spine, and combined with contrast, they yield results as accurate as those seen in liver MRI."

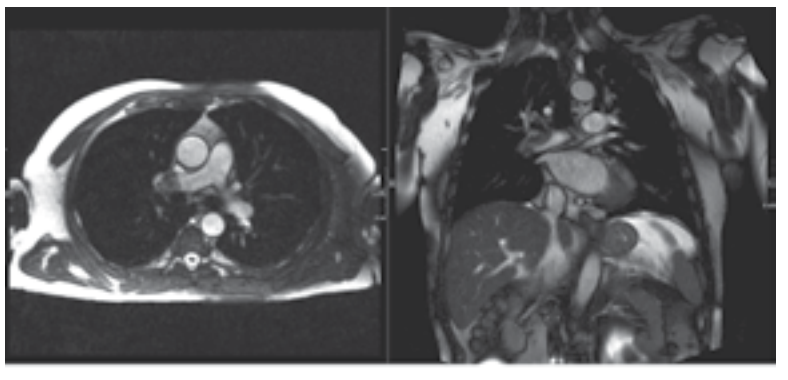
Today's special focus session on lung MRI should appeal to both general radiologists and subspecialists alike due to its wide range of technical and clinical pointers for optimal routine practice and the real advances to be made from emerging techniques such as ventilation MR.

"For certain indications, ventilation assessment could be done in the course of one MR exam rather than through extra studies such as ventilation scintigraphy," added Kauczor, who will moderate the session.

MRI has already partially reduced the overall number of patient exams Paediatricians prefer to avoid ionising radiation, so MRI is the first choice technique in cystic fibrosis, complicated pneumonia and some cases of lung metastases in children. In addition, some adult subgroups, such as lung cancer and cystic fibrosis patients, are now also referred to MRI programmes.

"Looking ahead, higher contrast sensitivity, greater speed and more robust sequences to cope with the effects of breathing will boost the practical applications of lung MRI," he said.

The changes are likely to be gradual, however. While dynamic contrast-enhanced perfusion studies are already well established for lung and cancer perfusion assessment, functional techniques such as diffusion-weighted MRI are increasingly complementing cancer protocols for staging lymph nodes and monitoring response to lung cancer therapy. Non-contrast MR angiography for diagnosing pulmonary embolism in pregnancy is gaining ground, while in the future, non-contrast-enhanced lung perfusion should provide additional information for diagnosing pulmonary artery obstruction and hypoxic vasoconstriction and for qualifying pulmonary hypertension, embolism and chronic obstructive pulmonary disease (COPD).



Non-contrast-enhanced steady-state fast spin-echo images (SSFP/TrueFISP) in a 64-year-old patient with renal insufficiency and suspected pulmonary embolism. (Provided by Prof. Jürgen Biederer)

questions straight away, according to Prof. Jürgen Biederer, section head of pulmonary radiology in the department of diagnostic and interventional radiology, Heidelberg University Hospital. Detailed questions can be investigated further through dedicated extensions to the basic protocols, he added.

In his talk, Biederer will flag up the key MRI protocols that every radiologist should know. General questions as to whether there is pneumonia after an equivocal x-ray or whether or not an enlarged mediastinum seen on chest x-ray relates to a mediastinal mass, can be answered through a simple non-enhanced morphological MRI. However, for staging chest wall invasion in cancer patients, or in cases of unclear pleural effusion, protocols using contrast sequences would be preferred.

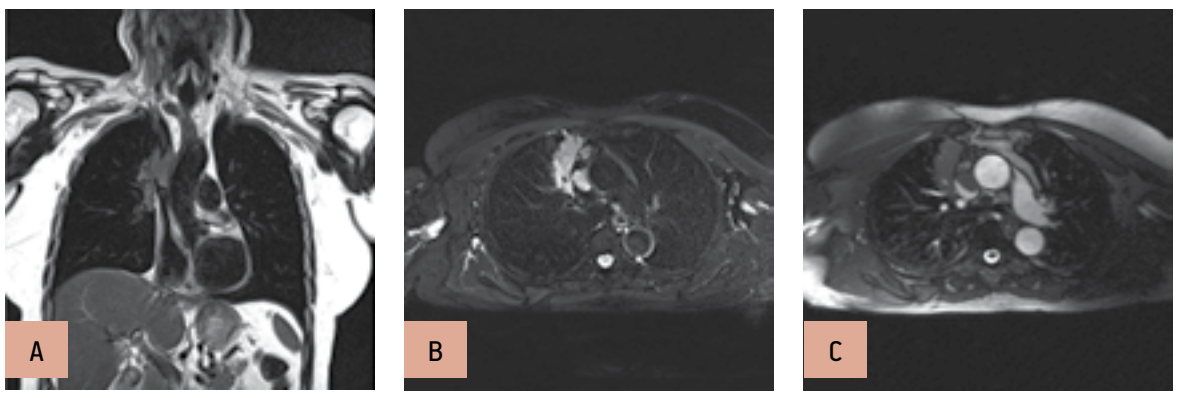
He also plans to outline how protocols can be used for procedures such as placement of central venous lines. For this procedure, it is necessary to rule out complications in the large chest veins such as thrombosis, vessel compression or vessel abnormality. A number of possible methods include non-invasive ultrasound, which is difficult to perform in the mediastinum, and more invasive venograms involving contrast and fluoroscopy, and even contrast-enhanced CT.

"Instead we can use an MR non-contrast-enhanced protocol – the same as for diagnosing pulmonary embolism – to look at the large chest veins and mediastinum. This is a simple, fast and comprehensive exam which doesn't even disturb a full scanner schedule," Biederer said.

Despite CT remaining the gold standard for lung cancer diagnosis, for indications such as Pancoast tumours or lesions close to the diaphragm, CT is difficult due to artefacts from the surrounding bone in the apex of the lung or due to breathing. Furthermore, better soft tissue contrast using MRI means that it can have advantages over CT for optimal patient management decisions, according to Prof. Edwin van Beek, SINAPSE chair of clinical radiology at the Queen's Medical Research Institute, University of Edinburgh, U.K.

For some pathologies, such as superior sulcus tumours, MRI is the principal staging modality as it is the only method to visualise both the lesion and its relationship to adjacent vascular and brachial plexus structures. Similarly, chest wall invasion can be better studied using MRI.

"MRI is key for early diagnostic assessment and staging, for monitoring patient response during treatment and later on after treatment to see changes, especially given that CT can't differentiate clearly between scar and tumour," said van Beek.



Thoracic MRI in a 62-year-old female in whom there were difficulties placing a central venous line. The non-contrast enhanced examination revealed a mass in the upper mediastinum with involvement of the superior vena cava, confirmed later by biopsy to be non-Hodgkin's lymphoma. A = coronal multi-breathhold T2-weighted sequence, B = transverse fat-saturated T2-weighted sequence, C = steady-state fast spin-echo sequence (SSFP /TrueFISP). (Provided by Prof. Jürgen Biederer)

"PET-CT and CT will remain the primary modalities for lung imaging, but as an adjunct, MRI should be used more often and replace PET-CT in certain cases. In early diagnosis, radiologists could move directly to MRI if a tumour is visualised on x-ray."

Multiple MRI sequences in the mediastinum can probe both tumour composition and invasion into adjacent tissues; bone metastases can be demonstrated using diffusion-weighted imaging with an accuracy rate close to PET-CT, while MRI perfusion can reveal perfusion of the lung, perfusion of the tumour, and tumour location in relation to blood vessels. More recently, contrast flow patterns in perfusion imaging of lung nodules, can indicate whether a tumour is benign or malignant. In addition, even when faced with a collapsed lung around the tumour, dynamic sequences can still determine or exclude its involvement with moving structures, such as the chest wall, the heart and the diaphragm.

"All one needs to do is pick the right mix of MR sequences to make meaningful decisions regarding tumour resectability," explained van Beek, adding that one of the most exciting and yet least applied techniques in daily practice is oxygen-enhanced MRI to show lung function and predict outcome in lung cancer, and patients usually fare better after an oxygen-enhanced scan before surgery.

Research at the University of Sheffield, U.K., has shown that functional data can have a significant impact on radiotherapy planning, resulting in sparing of healthy lung tissue, while optimising dose delivery to the tumour. Linked to this is hospital research in the application of hyperpolarised noble gas in MRI.

"Through scanning using polarised helium, we can see which part of the lung contributes to lung function and which part does not. Radiation beams can be focused to go through the non-contributing lung and thus avoid damage to healthy tissue, avoiding pneumonitis and loss of functionality," he concluded.

Special Focus Session

Friday, March 8, 08:30–10:00, Room F2

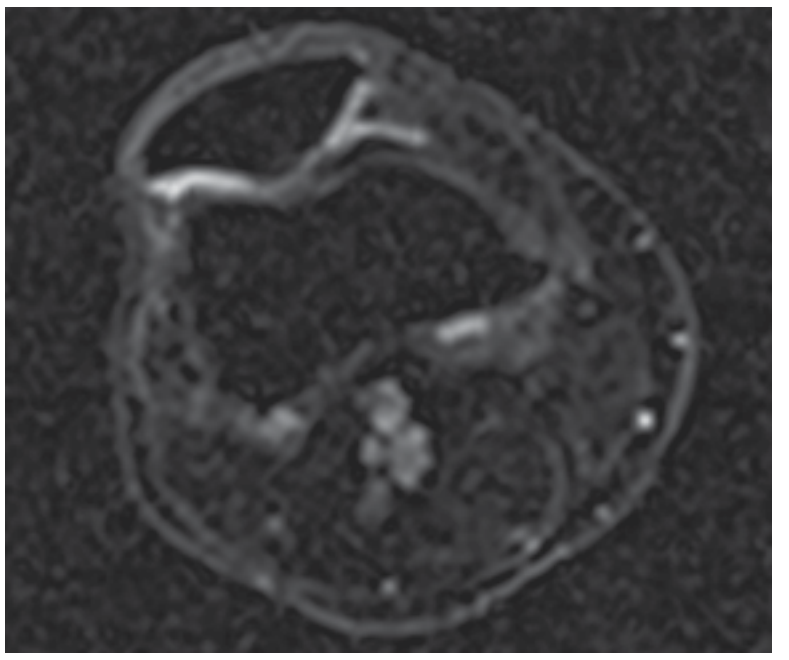
SF 4a: 'MRI of the lung: to go?'

- **Chairman's introduction: 'Apéritif'**
  H. Kauczor; Heidelberg/DE
- **'The sequence buffet'**
  J.M. Wild; Sheffield/UK
- **'Preparing your menu'**
  J. Biederer; Heidelberg/DE
- **'Bon appétit! Starters': cystic fibrosis, pneumonia and pulmonary embolism**
  M.U. Puderbach; Heidelberg/DE
- **'Bon appétit! Main course': pulmonary and mediastinal neoplasms**
  E.J.R. van Beek; Edinburgh/UK
- **Panel discussion: 'Bon appétit! Dessert': what are the benefits of MRI of the lung in clinical workflow and decision-making?**

#SF4a #ECR2013F2

New ways to image cartilage could help prevent osteoarthritis

By Mélisande Rouger



Sodium image in the axial plane of the patella shows the patellar cartilage. At the border from the medial to the lateral facet of the patella an area with decreased sodium signal-to-noise ratio (SNR) is visible which corresponds to a decreased content of glycosaminoglycan (GAG) although the cartilage thickness is preserved. This means an early stage of cartilage degeneration in this area with a focal loss of GAG.
(Provided by Prof. Siegfried Trattnig and the MR Centre of Excellence)

Sodium image of the ankle joint in the sagittal plane shows intact cartilage with high sodium SNR and a thickened Achilles tendon in the distal portion with increased sodium SNR which corresponds to an increased GAG content, which in the Achilles tendon represents chronic achillotendinitis.
(Provided by Prof. Siegfried Trattnig and the MR Centre of Excellence)

Osteoarthritis, a degenerative joint disease, affects a large number of people worldwide. But with the emergence of new MRI techniques, researchers believe they will be able to prevent its development in the near future. Experts will present the latest methods to assess cartilage tissue quality at a very early stage and discuss remaining challenges, in a dedicated New Horizons Session, today at the ECR.

Cartilage is composed of collagen and glycosaminoglycans (GAG), which are responsible for the biomechanical properties of cartilage tissue. An interesting way to image cartilage is to look at the amount of GAG, which decreases at the onset of tissue degeneration, a process which occurs due to ageing or an induced defect, for instance trauma or surgical intervention in the joints. If left untreated, a tissue defect can lead to osteoarthritis. GAGs are known to be among the earliest biomarkers of cartilage degeneration, and if a focal reduction in the amount of GAG can be identified, then therapy to avoid further damage can begin.

To image these early changes, three main techniques have been developed, all performed with MRI: sodium imaging, delayed gadolinium-enhanced MR imaging of cartilage (dGEMRIC) and GAG-dependent chemical exchange saturation transfer (gagCEST) imaging. For sodium imaging, a simple physical reaction is exploited: sodium ions have a positive charge and attach themselves to GAGs / which have a naturally occurring negative charge. This allows radiologists to track them in the body. Thanks to a special sodium coil, sodium in articular cartilage can be visualised and quantified, and these volumes can be directly correlated with GAG content.

"Performing sodium imaging is very exciting at the very early stage of cartilage degeneration, because we can already visualise glycosaminoglycan loss. All the other structures of the cartilage matrix are still intact, the network is intact, everything is the same except the amount of glycosaminoglycans. It is a formidable biomarker of early degeneration, it gives us the chance to identify patients at risk earlier and to possibly alter tissue degeneration, to prevent the development of osteoarthritis," said Professor Siegfried Trattnig, medical director of the MR Centre of Excellence at Vienna Medical University.

The joint can still regenerate with a GAG loss of up to 25%. Within this limit, drug therapy can be initiated, which focuses on replenishing GAG levels.

Groups of patients are at risk of cartilage degeneration, for instance people who have suffered trauma of the knee joint with meniscal or cruciate ligament tear and have received partial meniscectomy or ligament reconstruction. According to orthopaedic surgeons, the risk of developing osteoarthritis of the joint is more than seven times higher for these patients than for people who have never had this kind of injury.

For patients with trauma-induced defects, cell-based cartilage transplantation is a recommended option. Candidates must be under 50 and have a high-grade focal defect in the knee joint.

Sodium imaging can help assess the efficacy of different cartilage repair procedures by showing the development of GAG in the repaired tissue. "We are now able to visualise and quantify how much GAG has been produced over time. If, after one year, the patient shows the same content of glycosaminoglycans in the repair tissue compared to healthy cartilage, then this is optimal for the biochemical properties, in particular for the stiffness of the repair tissue," Trattnig said.

To carry out sodium examinations, an MR scanner with multinuclear capability and a dedicated transmit and receive sodium coil is required. However, the high signal-to-noise ratio of a 7 Tesla scanner is also needed to compensate for the low sensitivity of sodium in comparison to proton imaging (about 5,000 times lower for sodium). With only 50 7T MR scanners worldwide, the technique clearly faces a shortage of equipment.

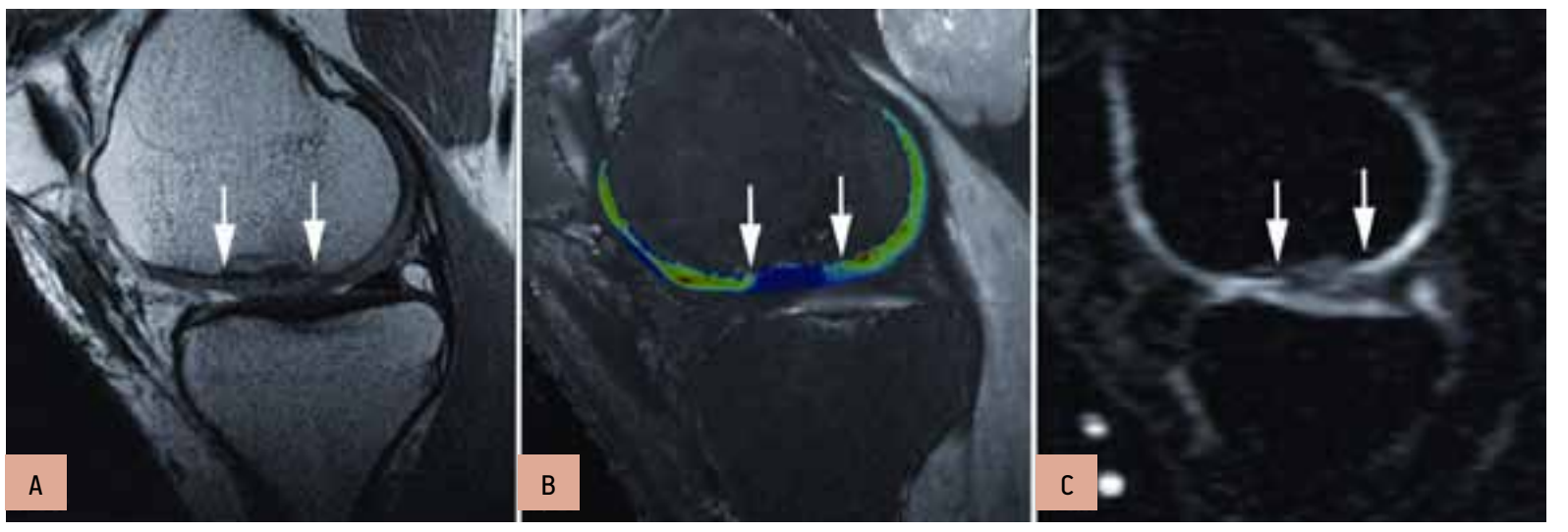
DGEMRIC is compatible with 3T MRI, but it requires a double dose of gadolinium-based contrast agent. As concerns have been raised regarding the use of gadolinium-based contrast agents in patients with kidney dysfunction, it is currently not the most favoured option. So, researchers are working on alternative techniques that do not require the use of gadolinium-based contrast agents but are still sensitive enough to image GAG at 3T. One of these techniques is gagCEST imaging, according to Dr. Benjamin Schmitt, a physicist working at the MR Centre of Excellence in Vienna.

"With gagCEST, we exploit the chemical exchange between exchangeable protons that are bound to GAG molecules and the surrounding bulk or free water molecules. We label the GAG molecules, then this label is transferred by chemical exchange to bulk water molecules, which is our major MRI signal, and we subsequently image the regular bulk water signal. With this information, we can determine how much label was transferred through the bulk water signal," he explained.

GAG concentration in the articular cartilage is in the millimolar range whereas bulk water concentration is in the high molar range. Being able to transfer and accumulate the GAG-specific label on bulk water molecules means a 100 to 1,000-fold increase in sensitivity for the detection of GAG molecules. This means that gagCEST imaging can be performed using 3T MRI systems.

Both sodium and gagCEST allow radiologists to assess the development of transplanted GAG in cartilage repair, which provides information on the biochemical quality of the repaired tissue. But it is not an indication of patient outcome, Schmitt explained. "It is a little bit of a problem, because the biochemical features as detected by MRI or radiological means do not necessarily correlate with the clinical outcome of a patient. For instance, the sensation of pain can be very different in humans," he said.

With gagCEST, researchers are looking to accelerate image acquisition time, currently at eight to ten minutes, which is too long for the clinical setting. They also have to find appropriate protocols for imaging the hip joint, which has very thin cartilage. These protocols have to compensate for the distance between the object and the coils, which is larger in the hip compared with small joints such as the knee. Experts will tackle all these and other issues today.



The sodium image of this patient (c) one year after autologous cartilage transplantation in the knee joint shows a low sodium SNR (the white arrows mark the border of the transplant), which corresponds to decreased GAG content of in the repaired tissue. This finding is confirmed by dGEMRIC another GAG specific technique (b). However the morphological image (a) with proton-density weighted FSE shows a good outcome with a good filling of the defect and a good integration of the repaired tissue.
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New Horizons Session
Friday, March 8, 16:00–17:30, Room C

NH 7: Cartilage imaging

- **Chairman's introduction**
  V.N. Cassar-Pullicino; Oswestry/UK
- **Sodium imaging**
  S. Trattnig; Vienna/AT
- **dGEMRIC (delayed gadolinium-enhanced MR imaging of cartilage)**
  G. Welsch; Erlangen/DE
- **Diffusion tensor imaging**
  C. Glaser; Munich/DE
- **CEST (chemical exchange saturation transfer)**
  B. Schmitt; Vienna/AT
- **Panel discussion: What are the envisaged future advances in these cartilage imaging techniques and can we expect to introduce them into clinical practice?**

#NH7 #ECR2013C

Prepare for the 'global paradigm shift' and transformation of care initiated by prostate MR imaging

By Edna Astbury-Ward

Some urologists continue to persist with the old methods of prostate biopsy and tumour detection, despite the benefits of MRI in visualising the most aggressive parts of prostate tumour, but the situation is changing fast, according to Prof. Jelle O. Barentsz, from the department of diagnostic radiology, University Hospital Nijmegen, The Netherlands.

The reasons behind this apparent resistance in some quarters are unclear, but it seems to be due to a combination of scepticism, turf protection, and financial aspects. The chief arguments put up by urologists against embracing MRI-guided biopsies in the first instance tend to be cost, lack of expertise with certified standards for radiologists and lack of large prospective randomised controlled trials.

This stance is refuted by Barentsz, who claims that just like learning to drive, urologists need to learn the technique from experts, gain experience and then be tested for their surgical expertise. He considers that radiologists need to have read a minimum of 200 examinations under supervision, with good standards for quality control at a central reference centre, and they must adhere to guidelines that have been developed by the European Society of Urogenital Radiology. Although these guidelines are not yet mandatory, Barentsz and his colleagues are collaborating with the American College of Radiology to further this process.

ECR delegates attending this afternoon's prostate session, which forms part of the day-long mini course on oncologic imaging, will learn about how to navigate their way through some of the blurring of boundaries in this specialist area, and can hear the latest advances in MR-guided prostate biopsy. Other speakers throughout the day will discuss lung, colon, kidney, liver, pancreatic and ovarian cancers, and there will be a discussion of musculoskeletal neoplasms and issues around chemo- and radiation-induced toxicity.

"Transrectal ultrasound (TRUS) biopsy has a true underestimation of 46%, whereas some studies show that the underestimation rate with MRI is only 5%," said Barentsz, who conceded that further large prospective trials are required to confirm this, but the studies are underway.

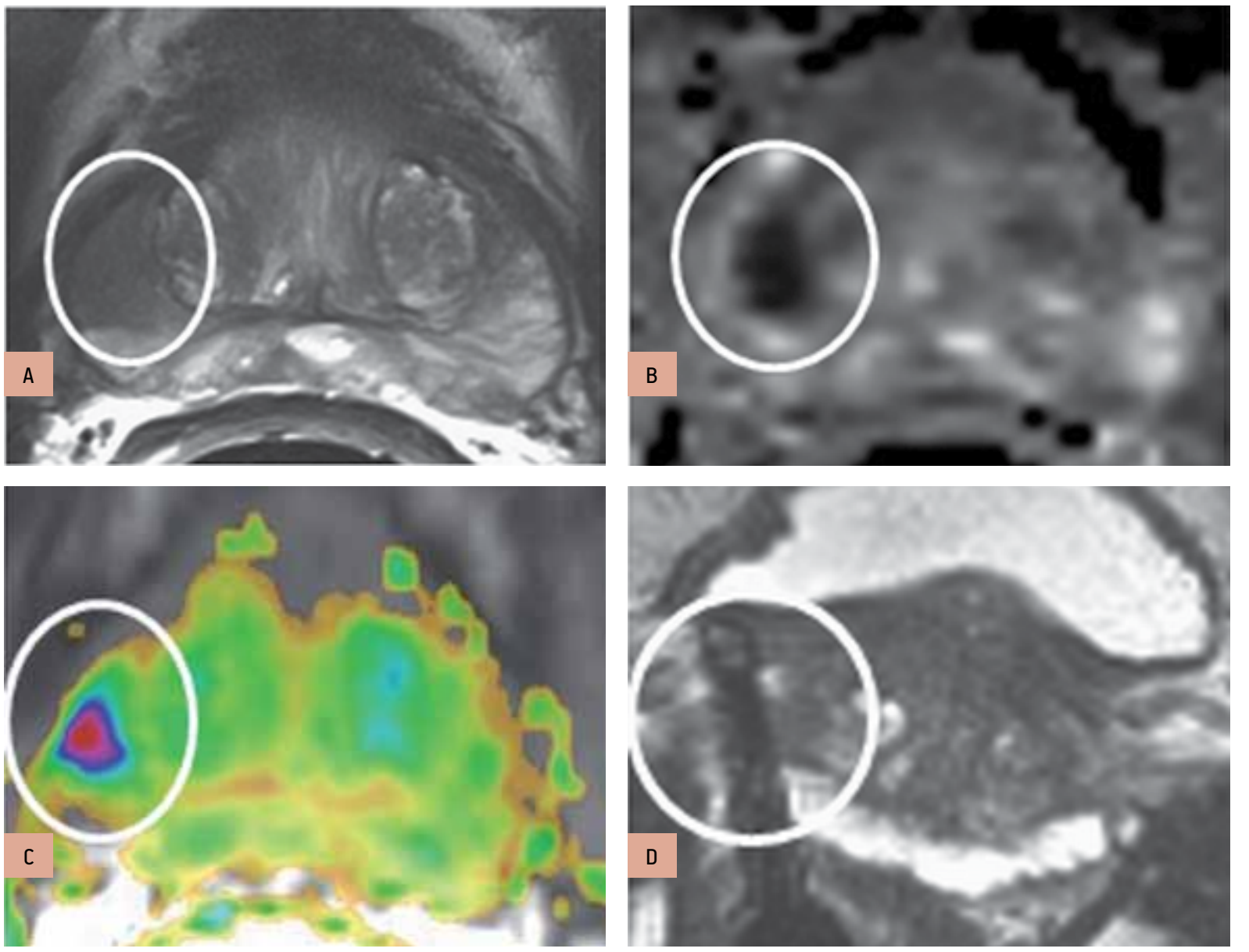
Barentsz is very involved with patient groups. He thinks that patients are becoming more aware and empowered, and he notes that many patients are now discussing the MR-guided ultrasound biopsy ('needle biopsy') procedure and are asking about alternatives.

"If the patient has a negative TRUS biopsy and the prostate specific antigen (PSA) is still rising, this is an absolute indication to do an MRI. It may be that the urologist has missed the tumour, and this occurs in between 46% and 50% of cases, however, the MR-guided biopsy will locate the lesion," he stated. "The other clear indication for MRI is when the patient requires treatment and needs a staging MRI, to visualise the prostate and see whether the tumour is at the aggressive or intermediate stage."

Compared with pelvic phased-array coils, the chief benefits of using endorectal coils are the better higher signal to noise ratio and the detection of minimal capsular penetration. With a 1.5-Tesla MR machine, the endorectal coil should be used, although the question as to whether an endorectal coil should be used with a higher field strength system is still under investigation. Barentsz also noted the high cost and patient discomfort as disadvantages of the endorectal coil. Three Tesla machines offer the advantage of higher throughput of patients, and this increases their cost-effectiveness.

A multiparametric approach promises improved detection and characterisation of prostate cancer. He thinks the way forward is T2-weighted diffusion and dynamic imaging. Future perspectives in prostate cancer imaging look set to be interesting, and he welcomes the day when all patients will have an MRI examination before they have a biopsy. Contrast agents such as iron oxide particles (small nanoparticles that travel to the lymph nodes) promise to assist in the detection of small (2 mm) lymph nodes. Barentsz hopes for more precise diagnosis of prostate cancer, which he believes will be achieved with the use of MR-ultrasound fusion and minimally invasive therapy by treating localised tumours with high intensity focused ultrasound under MR guidance.

Looking even further into the future of prostate treatment, he envisages the day when patients will be treated on an outpatient basis only; e.g., they will arrive in the morning for an MR-guided biopsy and histological confirmation, have a prostate tumour evacuated/treated via MR-guided cryo/needles, and leave the hospital the same day. The future is already here, he concluded.



69-year-old patient with a low-grade (Gleason 3+3) prostate cancer (1/10 cores positive, < 5%) confirmed by transrectal ultrasound biopsy. Therefore, the patient was a candidate for active surveillance. A: T2-weighted MRI shows low signal lesion (circle) in right peripheral zone. B: ADC map shows restriction is this area (ADC value: 650), and bright area on high b value (1400) diffusion-weighted image. C: Dynamic contrast-enhanced MRI shows focal unilateral area with curve type 3. Prostate imaging reporting and data system (PI-RADS) classification for significant cancer: 5-5-5, final score 5. This fits an aggressive tumour. D: MR-guided biopsy shows lesion (circle); needle = white line, showed 2/2 cores each 80% Gleason 4+3 prostate cancer. Due to this MRI examination, this patient's prospects have improved, and he will now have a prostatectomy. (Provided by Prof. Jelle Barentsz)

Mini Course: Joint Course of the ESR and RSNA

Friday, March 8, 08:30–10:00, Room I/K

MC 428: Essentials in oncologic imaging: what radiologists need to know (part 1)

Moderator: D.M. Panicek; New York, NY/US

A. Principles of oncologic imaging and reporting
D.M. Panicek; New York, NY/US

B. Lung cancers (primary, metastases)
C.J. Herold; Vienna/AT

C. Colon cancer
R.M. Gore; Evanston, IL/US

Questions

#MC428 #ECR2013IK

Friday, March 8, 10:30–12:00, Room I/K

MC 528: Essentials in oncologic imaging: what radiologists need to know (part 2)

Moderator: H. Hricak; New York, NY/US

A. Pancreatic cancer
F. Caseiro-Alves; Coimbra/PT

B. Kidney cancer
E.K. Fishman; Baltimore, MD/US

C. Ovarian cancer
H. Hricak; New York, NY/US

Questions

#MC528 #ECR2013IK

Friday, March 8, 14:00–15:30, Room I/K

MC 628: Essentials in oncologic imaging: what radiologists need to know (part 3)

Moderator: Y. Menu; Paris/FR

A. Oncologic imaging: terminology, definitions and buzzwords
Y. Menu; Paris/FR

B. Liver cancers (primary, metastases)
R.L. Baron; Chicago, IL/US

C. Prostate cancer
J.O. Barentsz; Nijmegen/NL

Questions

#MC628 #ECR2013IK

Friday, March 8, 16:00–17:30, Room I/K

MC 728: Essentials in oncologic imaging: what radiologists need to know (part 4)

Moderator: M.F. Reiser; Munich/DE

A. Lymphoma
H. Schoder; New York, NY/US

B. Musculoskeletal neoplasms
M.F. Reiser; Munich/DE

C. Chemo- and radiation therapy-induced toxicity
H.-U. Kauczor; Heidelberg/DE

Questions

#MC728 #ECR2013IK

Most of Europe still missing out on benefits of clinical audit

By Simon Lee

Self-improvement is an essential part of daily life for many people working in healthcare, and radiographers are certainly no exception. The huge popularity of scientific and educational conferences, despite widespread economic hardship, shows that the majority of health professionals are seeking to keep on top of developments in their respective disciplines, and in the fast-changing world of medical imaging this is especially true. But although radiological staff generally make great efforts to improve their skills and knowledge, procedural improvement sometimes takes a back seat.

The idea of carrying out ongoing critical assessment of radiological procedures in order to make improvements is a simple one, and one that has obvious benefits for patients, staff, and service providers alike. ECR 2013 attendees will hear exactly how those benefits can be realised, during today's radiographers' Refresher Course 'Clinical audit: from EURATOM to the clinical environment'. Speakers from three countries that have experienced the positive results of introducing clinical audit will provide their own accounts of how to interpret the principles and guidelines, how implementation can be managed, and exactly what the impact can be.

EU member states have been required to implement clinical audits since the European Commission published Directive 97/43/EURATOM in 1997, with the intention of improving the quality of patient care and efficiency of service delivery. The reality is, however, that even with the introduction of EC guidelines on clinical audit in 2009, only a handful of countries have pursued implementation in any meaningful way, due partly to a lack of clear compulsion to do so and some confusion over where the burden of responsibility should lie.

"If one looks at what should be controlled, assessed or evaluated in daily practice to improve quality, improve patient security and to promote a radiation protection safety culture, these are all key issues for the radiography profession," said Professor Graciano Paulo, president of the European Federation of Radiographer Societies, from Coimbra, Portugal. "Implementing clinical audit on a regular basis would clearly help to develop better radiography practice and better quality healthcare, but we are concerned that most countries are still not doing clinical audit as they should: according to the guidelines and according to the EURATOM directive."

Although the standard of practice in radiography throughout Europe is generally excellent, there is no doubt that establishing an institutionalised system that guides radiographers through a process to recognise and eliminate mistakes, would improve it further. Unfortunately human error is inevitable, but in healthcare the consequences of poor practice can be life-altering. Introducing clinical audit, or even making individuals aware of which areas of their work should be subjected to closer control, can lead to significant reductions in the number of errors.

"Radiographers need to be aware of the concept, or at least that it's possible to do better and that they should know what to check in order to avoid errors," added Paulo. "There will always be errors; but the best departments are the ones that make fewer errors. There is no such thing as an error-free department. Acknowledging this concept is the first step toward decreasing errors."

According to Päivi Wood, chief executive officer of the Society of Radiographers in Finland, who will speak at the session, the first step on the path to reducing errors is to convince staff of the value of clinical audit as a tool for professional development and the improvement of patient care.

"We still have a lot to do. There are a lot of guidelines and recommendations that people are not fully aware of, which quite often they feel do not apply to them, and which some people have a fairly defensive attitude towards," said Wood. "This is why we need to improve understanding of how clinical audit can affect everyday work and patient care. Some of the resistance to clinical audit stems from the unspoken feeling that people don't like to be judged, but we have to persuade people to look past that and recognise the enormous benefits. We need to roll up our sleeves and work harder to increase radiation safety and improve our work in every single country in Europe," she added.

During her lecture, Wood will talk about the positive experiences in Finland, where the recommendations of the EURATOM treaty have been fully implemented into Finnish legislation with the full involvement of radiation and nuclear medicine authorities, radiologists, radiographers, and medical physicists. Clinical audit in Finland now covers the whole process of medical imaging; not only the work of radiologists and radiographers, but also that of the referring physicians. The basis on which referrals are made and the referring physician's awareness of safety issues are all taken into account, as well as the outcome, the effectiveness of the examination and how it may have affected the patient's care.

Aside from the immediate benefits brought by closer attention to routine practice, other effects of implementation have included a heightened interest in continued professional development and a huge increase in the documentation of procedures, creating a much larger body of reference material. Different models of clinical audit have seen success in the Netherlands and the UK, among other countries, but one of the key features of the Finnish model is its breadth, according to Wood.

"This is 100 per cent a multi-professional issue. It's about teamwork and it really helps you to understand the work of the related professions' when you do clinical audit together. Radiologists, medical physicists, and even the vendors who provide the machinery, have a role to play in this process. Clinical audit is an important issue to anyone who may be included in it, from referring physicians to everyone involved during and after imaging examinations. When it is implemented, they need to be aware of it and to know what is expected of them."

Refresher Course: Radiographers
Friday, March 8, 16:00–17:30, Room P
RC 714: Clinical audit: from EURATOM to the clinical environment
Moderators: E.J. Adam; London/UK
D. Pronk-Larive; Middelburg/NL

A. Clinical audit: from the EURATOM treaty to EU guidelines: clinical audit RP 159
P. Wood; Helsinki/FI

B. Implementation in practice: a comparison of different models
S. Geers-van Gemeren; Utrecht/NL

C. A perspective on the impact and benefits of clinical audit
S. O'Connor; Dublin/IE

#RC714 #ECR2013P

Experts to push new HCC interventional procedures criteria at ECR

By Mélisande Rouger

The range of interventional radiology techniques for hepatocellular carcinoma (HCC) is continuously expanding and could benefit many more patients if used more widely. Experts will present delegates with the methods currently available and inform them of the newest standards of practice today, during a dedicated Refresher Course at the ECR.

HCC prognosis has significantly improved in recent years. Diagnosis can be established through biopsy and imaging techniques. Internationally agreed standards like the Barcelona criteria, which detail how to diagnose and treat these lesions depending on the staging of the tumour and liver cirrhosis, are generally well-known and accepted.

HCC is a unique situation for radiologists, as they not only provide technical support but also play an active role in every step of management, especially in cirrhotic patients or patients with chronic hepatitis, according to Professor Vlastimil Válek, head of the department of radiology at Brno University Hospital and Medical Faculty. "HCC is a very interesting tumour because we can diagnose it with MR, CT or contrast US, and treat it in the majority of cases. In patients with liver cirrhosis or hepatitis, we can detect lesions, differentiate and establish diagnosis, and finally we can provide treatment. The choice of treatment method and its success depend on the extent of the malignant disease and the functional impairment of remaining liver parenchyma," said Válek, who will chair the course.

Early diagnosis means that the tumour is still relatively small, which allows minimally invasive therapies like percutaneous treatment with radiofrequency thermal ablation or ethanol injection, in which the radiologist introduces absolute alcohol via a needle directly into the tumour to destroy it.

Another option is transcatheter arterial chemoembolisation (TACE). A common therapy, TACE consists of introducing a material with a catheter directly into the artery feeding the tumour in order to block the artery and starve the tumour. The earlier cancer is detected, the more options there are to treat it. "If the tumour is small and there is no severe liver cirrhosis, then alcoholisation, thermal ablation, chemoembolisation, liver resection and transplantation are all possible," Válek said.

The incidence of HCC is generally low in Europe, so most countries do not run any specific screening programme (at risk patients are, however, screened regularly in France, Greece, Spain, Portugal and Italy, where the incidence is higher than the rest of Europe). The diagnosis of HCC tends to be made rather late in European countries, which means that the tumour is usually larger than three centimetres.

Radiofrequency ablation (RFA) is generally recommended for the treatment of early stage HCC. But when the patient is considered inoperable, RFA can also be indicated for large tumours, sometimes in combination with other procedures in clinical trials. "After correctly indicated and performed RFA, we can expect to improve survival by five years in 40 to 70 percent of patients and provide curative treatment in 30 percent of the patients. RFA is an excellent method, which also plays an important role in the multidisciplinary treatment of HCC," Válek explained.

TACE can also be offered to patients before liver transplantation. Candidates for liver transplants often have to face very long waiting lists, sometimes more than a year. To minimise this waiting, interventional radiologists can perform TACE for HCC larger than three centimetres with very positive results. "In such situations we can very often improve survival by three to five years. TACE is an excellent method, actually recommended as a first line non-curative therapy for non-surgical patients with large-multifocal HCC who do not have vascular invasion or extrahepatic spread," he said. Portal vein embolisation (PVE) is performed before liver resection in patients presenting with liver cirrhosis. The aim is to induce selective hepatic hypertrophy in the liver portion without tumour; a liver remnant of 40–50 percent is considered safe in patients with chronic liver disease. PVE has been shown to dramatically increase the chances of survival after surgery and has become a standard HCC interventional procedure.

These procedures have long been known to specialists; however, the absence of standards and protocols has hindered the transmission of knowledge. This is no longer the case as the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) recently published standard techniques and protocols for a number of HCC interventional radiology procedures.

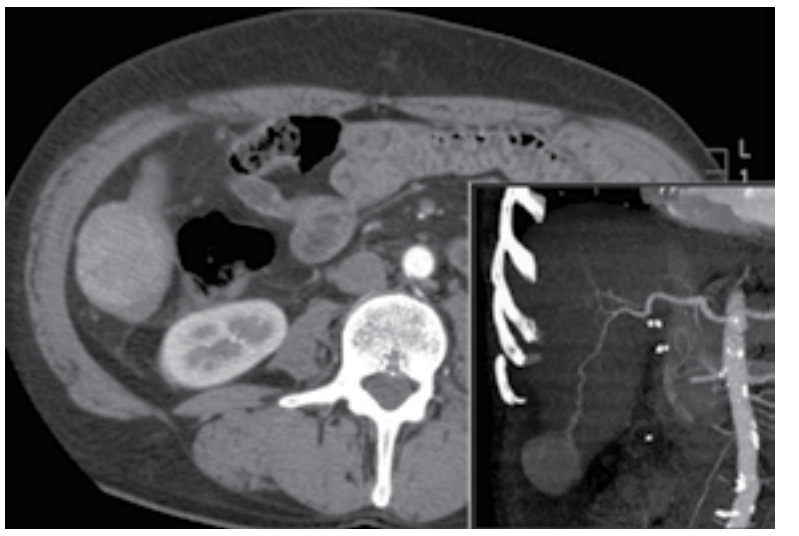
"Part of the reason we have this course is to establish indication criteria and extend these methods to all European countries. These techniques are extremely important techniques in many patients with HCC and cirrhotic liver tissue, who are not candidates for liver transplantation or resection," Válek said.

Refresher Course: Interventional Radiology
Friday, March 8, 16:00–17:30, Room N/0

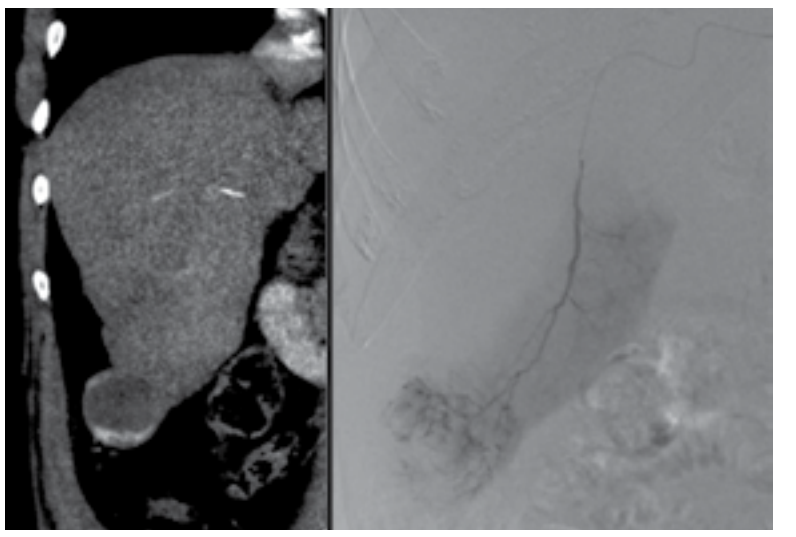
RC 709: Expanding the role of interventional radiology in hepatocellular carcinoma

- **Chairman's introduction**
  V. Válek; Brno/CZ
- **A. RF ablation**
  J.L. del Cura; Bilbao/ES
- **B. Intra-arterial procedures**
  F. Orsi; Milan/IT
- **C. Portal vein embolisation before surgery**
  A. Denys; Lausanne/CH
- **Panel discussion: How to allow for more patients with HCC to be treated?**

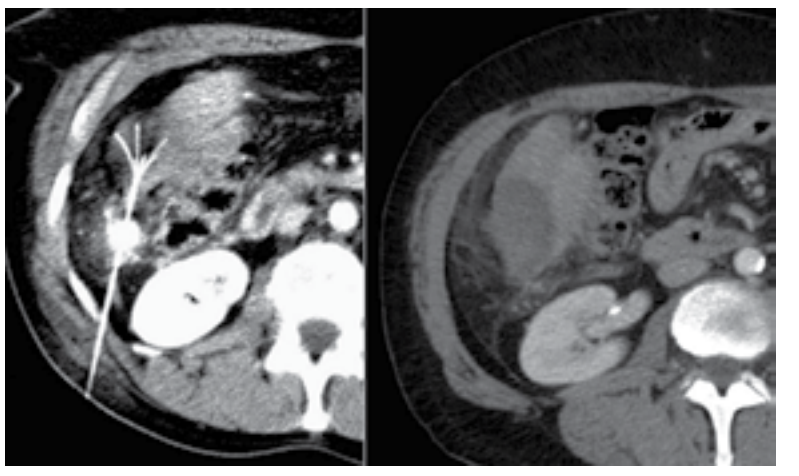
#RC709 #ECR2013NO



Solitary HCC nodule 5cm



Partial response after two treatments of chemoembolisation with drug eluting beads



Radiofrequency ablation of residual part of tumour inaccessible with transarterial technique
(All images provided by Prof. Vlastimil Válek)

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ECR gives platform to radiographers in ultrasound management debate

By Mélisande Rouger

The global demand for medical imaging examinations has been growing rapidly over the past decade. Sustaining a workforce to match demand is becoming a challenge, as an increasing number of hospitals are facing a shortage of radiologists. Some countries have filled the gap by allowing radiographers to perform and interpret ultrasound examinations independently, to relieve the pressure on staff. This option continues to divide the European radiological community, and many seem to be against delegating a medical act to non-doctors. However, new educational opportunities and radiographers' growing interest in medical science are challenging this concept, a panel of radiographers will show during a Special Focus Session chaired by a radiologist and a radiographer at ECR 2013.

Ultrasound is a widely available modality and many medical specialists are using it without the help of radiologists, sometimes without sufficient knowledge and to the detriment of patients. However, radiographers who have received proper theoretical and clinical training know how to best use the modality and read images correctly, according to Dean Pekarovic, a radiographer at the University Hospital of Ljubljana, Slovenia, and member of the advisory board of the European Federation of Radiographer Societies (EFRS). "Ultrasound is a very competitive field, everybody wants to use it. But not everyone has the ability to perform an examination and interpret images appropriately. Radiographers with specific training are able to carry out such examinations and can even write reports on their own," he said.

In several EU countries, radiographers perform US-based musculoskeletal, urogenital and gastroenterological examinations, as will be shown during the session. "According to our perspective, radiographers who have received additional training can acquire ultrasound images alone, according to existing standards developed in conjunction with radiologists, who, due to technological evolution and the development of new devices, are shifting their professional activities to other imaging procedures," said Pekarovic, who will chair the session.

In Europe, radiographers are required to have at least a bachelor's degree, which they often complete with additional training in their field of interest. With the current model of bachelor-masters-doctorate, they now have the option of specialising in science, including medical imaging. Many are choosing to do so, and ultrasound is particularly attractive because it opens new fields of investigation, noted Professor Valérie Vilgrain, chair of the department of radiology at the University Beaujon Hospital, Clichy, France.

"Radiographers really want to expand their skills and it's very interesting for them to perform ultrasonography. Until now, they did a lot of x-ray, MR, CT and helped prepare the angiography suites for interventional procedures. Their role is very important, as they assist radiologists, prepare and set the machines, talk to the patient, help place them correctly in the machines, etc. US now offers them new possibilities, and many are motivated to explore this potential," said Vilgrain, who will also chair the session.

"Radiographers are interested in expanding their fields of activity. They already have many responsibilities and skills, especially regarding patient contact and radiation protection, they are totally able to carry out the whole examination and write the report," Pekarovic added.

Ultrasonography is considered a medical procedure in France, meaning that doctors are responsible for the examination, from leading the initial clinical investigation to writing the medical report. To this day, radiographers have not received authorisation to carry out these examinations independently, but this is currently under evaluation at Nancy University, which is running a dedicated regional trial, the Lorraine protocol. If positive, the experience could be extended nationally.

"This test reflects just how important these questions have become. It's a hot topic and a very delicate situation. Europe is really divided, every country has a different approach. Meanwhile, there is a pressing need to find competent staff to image patients. We really need to ask ourselves whether we can do everything by ourselves and whether our strategies are efficient or not, and consider what is going on in other countries," said Vilgrain, who suggested taking a look at healthcare management in North America.

"For instance, in the United States, radiologists remain legally responsible, but it is the radiographers who perform the ultrasound examination. Radiologists read the ultrasound images, sometimes monitor several ultrasound examinations at the same time, and complete the report if necessary. This has been working for years in North America, so it makes us wonder whether it could work here as well, even if ultrasound tends to be much more commonly used in Europe," she explained.

Dean Pekarovic from the University Hospital of Ljubljana, Slovenia.

Professor Valérie Vilgrain from the University Beaujon Hospital, Clichy, France.

Another thing to consider is the expanding nature of radiology and its growing trend of subspecialisation. "You have so many possibilities offered by CT, MRI and even US nowadays. The technology has changed a lot, it is extremely varied. Radiologists tend to be specialists, but they cannot specialise in five or six different fields. So you need more specialised staff if you want to provide quality service," Pekarovic said.

Just how much of a hot topic the management of ultrasound has become is perhaps best shown by the fact that, for the first time, radiographers have been invited to take part in a Special Focus Session, one of the ECR's most prestigious and popular sessions. Radiologists and healthcare managers should find it useful to learn about the ultrasound experience of radiographers from three European countries. But this is just the beginning of a long and complex process, Vilgrain believes.

"It's interesting for radiologists to see what is happening in Europe. The debate is far from over I think, these are single experiences. Governments also have a role to play in this equation. Many say that it would be cheaper to have non-doctors perform medical procedures, but it requires a real evaluation to know whether it is efficient or not. Radiology is expanding, everyone must have their place but there's plenty of space. When sharing competences is necessary, then we have to talk about it. We need to think about our profession, because it has changed enormously. We need a real discussion about this. What we also need is more cooperation with radiographers, which for the moment hasn't really started because our objectives and how to fulfil them have not yet been defined," she said.

Special Focus Session
Friday, March 8, 16:00–17:30, Room F1
SF 7a: Radiographers and ultrasonography in Europe

- **Chairmen's introduction**
  D. Pekarovic; Ljubljana/SI
  V. Vilgrain; Clichy/FR
- **Levels of training and competencies across Europe**
  M. Stanton; Dublin/IE
- **The role and impact of the radiographer conducted US in Portugal**
  R. Ribeiro; Lisbon/PT
- **Evolution of radiography education for US in the Netherlands since 1990, and its influence on their role**
  G. Plug; Haarlem/NL
- **Panel discussion: What are the challenges and barriers facing role extension?**

#SF7a #ECR2013F1

INSIDE TODAY

An automatic system for anatomical labelling of airways from CT images
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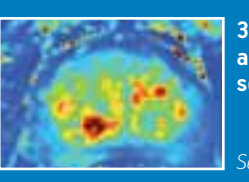
Innovative algorithms for image analysis and complex data visualisation
See page 21



3D Slicer: a freely available software platform
See page 23

CT vendors focus on iterative reconstruction and cardiac applications in their research and development efforts

By John Bonner

Innovation in software technologies, rather than shiny new hardware, provides the main talking points for visitors to the CT equipment manufacturers' booths at this year's ECR commercial exhibition. Companies are demonstrating novel approaches to reducing radiation dose, improving image quality and extending the capabilities of this modality in imaging cardiac patients.

Iterative reconstruction software has become a well-recognised route to reducing patient dose in CT examinations, but **Philips Healthcare** is showing how this approach can also be used to produce virtually noise-free images and provide significant improvements in low contrast resolution. Indeed, the company has suggested that the benefits offered by its new Iterative Model Reconstruction (IMR) process can provide a level of detail that is more commonly associated with MRI scans.

IMR has been made possible through the development of the company's first iterative reconstruction technique built on a knowledge-based model. The technology is enabled by innovations in both hardware and new algorithms that offer reconstruction speeds that allow IMR to be used in even the most demanding applications, according to Philips.

The main reported benefits of the new product are its low contrast resolution with virtually noise-free images and a 2.7 times increase in low contrast detectability. Philips warns that in clinical practice, the degree of noise reduction will depend on the specific clinical task, patient size, anatomical location and other factors. Therefore, a consultation with a radiologist and medical physicist is recommended to determine the appropriate dose to create the required image quality. However, the technology will typically offer less than five minute reconstructions for the majority of reference protocols, and is currently available with the Philips iCT and Elite class of scanners.

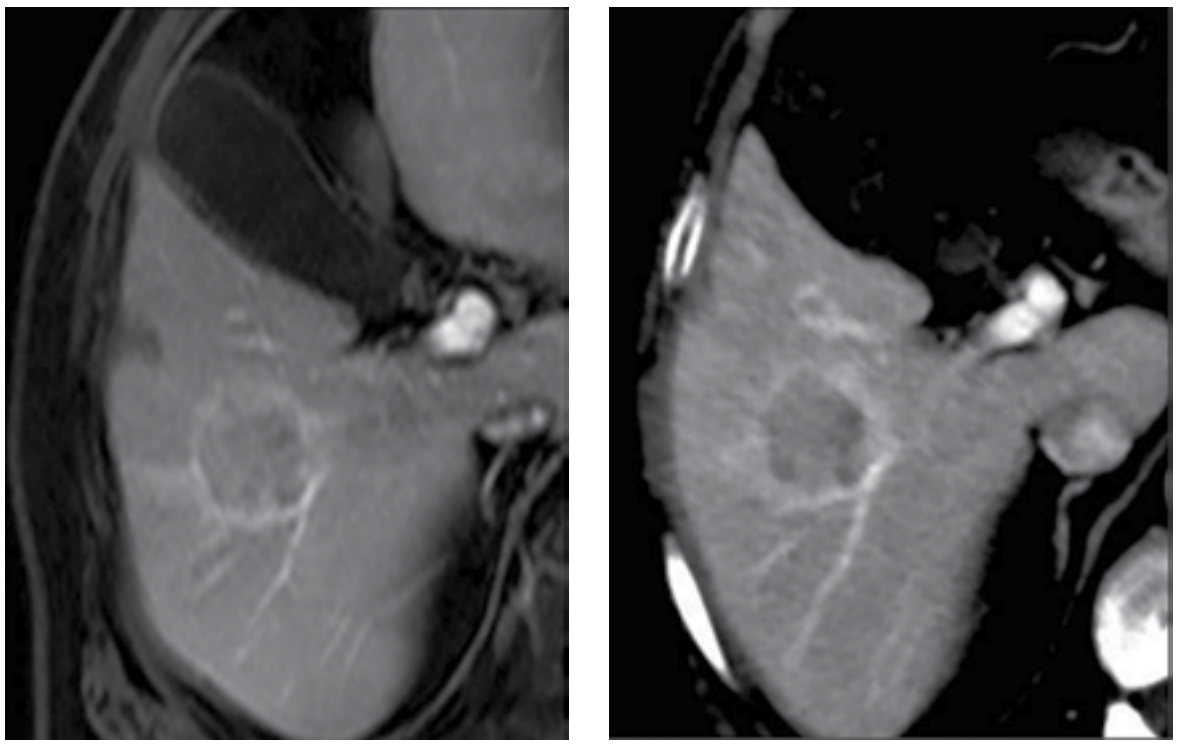
For its CT product range, the company is also offering two other ways of improving image quality: iDose and metal artefact reduction for orthopaedic implants (O-Mar). The former is a means to improve image quality through increased spatial resolution and reduced artefacts at low dose. O-Mar reduces artefacts caused by large orthopaedic implants. Available as part of its iDose Premium package, both features will become standard this year for 32 slice and higher members of the iCT and Ingenuity scanner families.

GE Healthcare is exhibiting a new scanner specifically designed to provide safe, high performance scanning of patients with suspected cardiac conditions. The new Optima CT660 Freedom edition is available with intelligent coronary motion correction features and expanded capabilities for use in the emergency room.

Based on the company's FREEdom technologies (Fast Registered Energies & ECG), the system offers a solution to 'freeze' coronary motion in higher heart rate CT angiograms. This is achieved through the SnapShot Freeze component, which can significantly reduce coronary motion and overcome the inherent limitations of hardware-only solutions. By precisely detecting vessel motion and velocity, SnapShot Freeze can determine actual vessel position and intelligently correct the effects of motion during the exam, according to GE.

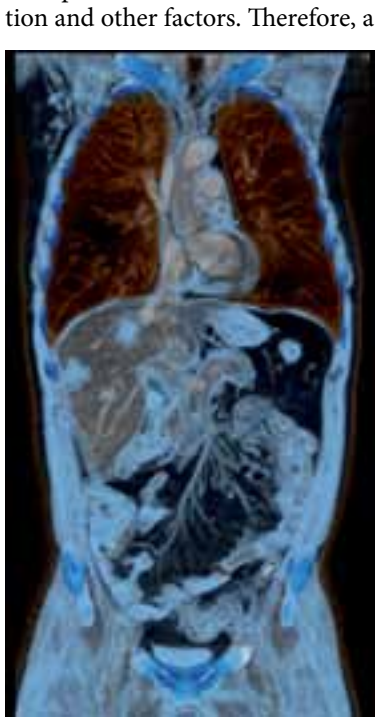
Users of the Optima CT660 system can scan quickly in one pass with diagnostic image quality and images reconstructed in real time, so the scan will take only a few seconds, which may be vital in an emergency room setting. Meanwhile, in cranial studies of suspected stroke patients, the scanner also offers extended coverage of 80 mm with VolumeShuttle, providing twice the brain coverage for a single bolus of contrast at lower dose than continuous acquisition techniques. The high power capability and thin slices also provide the demanding clarity needed for detecting small lesions, the company said.

"We believe the traditional challenges of cardiac CT are in large part beatable with a smarter software and electronic approach," said Steve Gray, vice president and general manager of GE's CT business. "Freedom Edition offers physicians a new tool to help overcome coronary motion and various artefacts that may stand in the way of a highly accurate, confident cardiac diagnosis in a variety of clinical settings."



3T MRI examination of the liver (left) compared with a CT image using the Iterative Model Reconstruction (IMR) technique. The lesion detected on CT was confirmed by MRI. (Provided by Philips)

Fast Spine, a component of Fast Care, can deliver an automatic segmentation of the spinal canal and automatic labelling of the vertebrae. (Provided by University Hospital of Zurich)



This case of a liver tumour was examined with a Somatom Perspective scanner from Siemens. The volume-rendered technique (VRT) image highlights multiple liver lesions and fine details of the mesenteric arteries. (Provided by Diagnosezentrum Favoriten, Vienna)

At its ECR booth, **Hitachi** is demonstrating an upgrade for the Scenaria 64-detector row scanner that offers 128-slice reconstruction. The new Scenaria Advantage 128 platform features the company's second-generation iterative reconstruction algorithm, called Intelli IP (Advanced), which can double the speed of reconstruction from 18 images per second to 35.

After reducing the noise in the projection space based on an iterative process involving a high-precision statistical model, Intelli IP (Advanced) tunes image quality using anatomical and statistical information in the image space. This enables it to greatly reduce the amount of image noise and streak artefacts, the company explained.

Toshiba has unveiled a new version of its 320-detector row scanner, Aquilion One, first launched in 2007. The latest version has been developed with a faster gantry rotation speed and a more powerful x-ray generator, giving clinicians the ability to perform cardiac imaging of patients with rapid heart rates in a single gantry rotation.

The Aquilion One Vision Edition is equipped with a gantry rotation of 0.275 seconds, a 100 kw generator and 320 detector rows (640 unique slices) covering 16 cm in a single rotation. The system can accommodate more patients with its 78 cm bore and fast rotation, including bariatric patients and those with high heart rates.

The unit is equipped with the company's third-generation iterative dose reconstruction software, AIDR 3D, which can reduce radiation dose compared with conventional scanning.

"Aquilion One Vision Edition reduces risk and maximises returns," said Satrajit Misra, senior director of the CT Business Unit at Toshiba. "It is capable of imaging the entire brain and heart in a single rotation with 500-micron accuracy, and can capture both anatomical and functional data." The integrated AIDR 3D radiation dose reduction technology creates safer exams for improved patient care, he added.

Siemens has announced a new member of its family of CT scanners: a 64-slice configuration of its 128-slice Somatom Perspective machine, designed to be an efficient and affordable technology. With a small footprint of just 18 square meters, an installation period of one to two days and low energy consumption and cooling needs, the two Perspective scanners are among the most cost-effective systems in their class, according to the manufacturer. The new 64-slice machine is designed for

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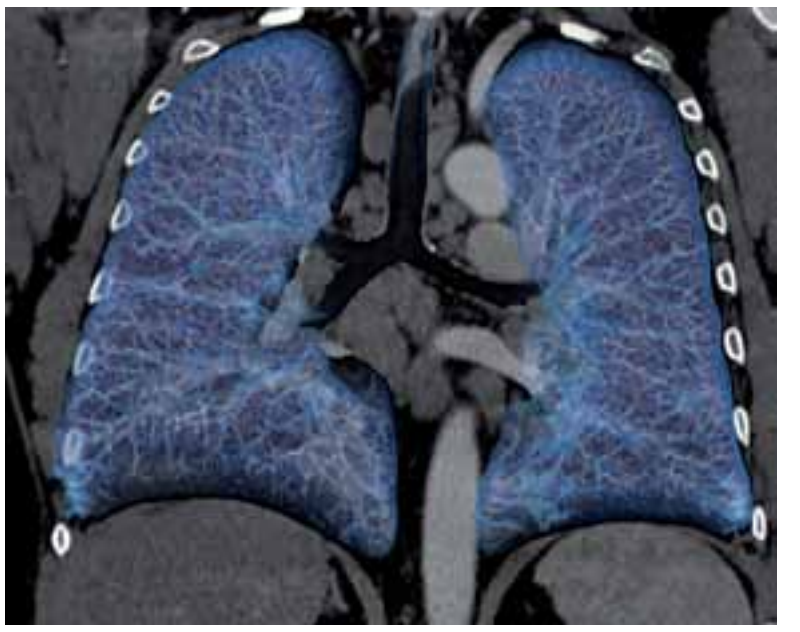
use in outpatient environments and in small- to medium-sized hospitals where CT tasks focus on routine applications.

Both units are equipped with the eMode feature that automatically sets scanning parameters to run the equipment more efficiently, lowering maintenance costs and increasing the working life of the system.

Another feature of the new product is the FAST (fully assisting scanner technologies) CARE (combined applications to reduce exposure) platform, which aims to simplify and automate time-consuming and complex procedures before, during and after the scan. This is intended to optimise the entire examination process, as it brings together all the steps involved, from scan preparation and performance through image reconstruction to diagnosis in a single integrated solution, claims Siemens.

The Fast Care process has been developed to improve workflow, and the vendor is now offering it as standard for all machines in its range.

"Patients will benefit from an improved clinical workflow along with the greater availability of advanced clinical services like cardiac examinations. Fast Care raises productivity, allowing medical professionals to spend more time with their patients," noted Jan Freund, head of CT product marketing management with Siemens Healthcare.



In this case of lymphoma, the VRT image shows multiple enlarged lymph nodes in the mediastinum and anatomical details in the lungs.
(Provided by Clinique Sainte Marie, Paris)

Age of austerity drives much needed change in focus for European CT imaging

By Stephen Holloway

The European Computed Tomography (CT) market is experiencing a challenging period. Increased awareness of radiation dose, limited healthcare budgets and increased use of ultrasound and MRI are all impacting demand for new CT equipment. Following market decline of approximately 25% since 2008 in the midst of continued economic uncertainty, the outlook for CT equipment could be viewed as bleak.

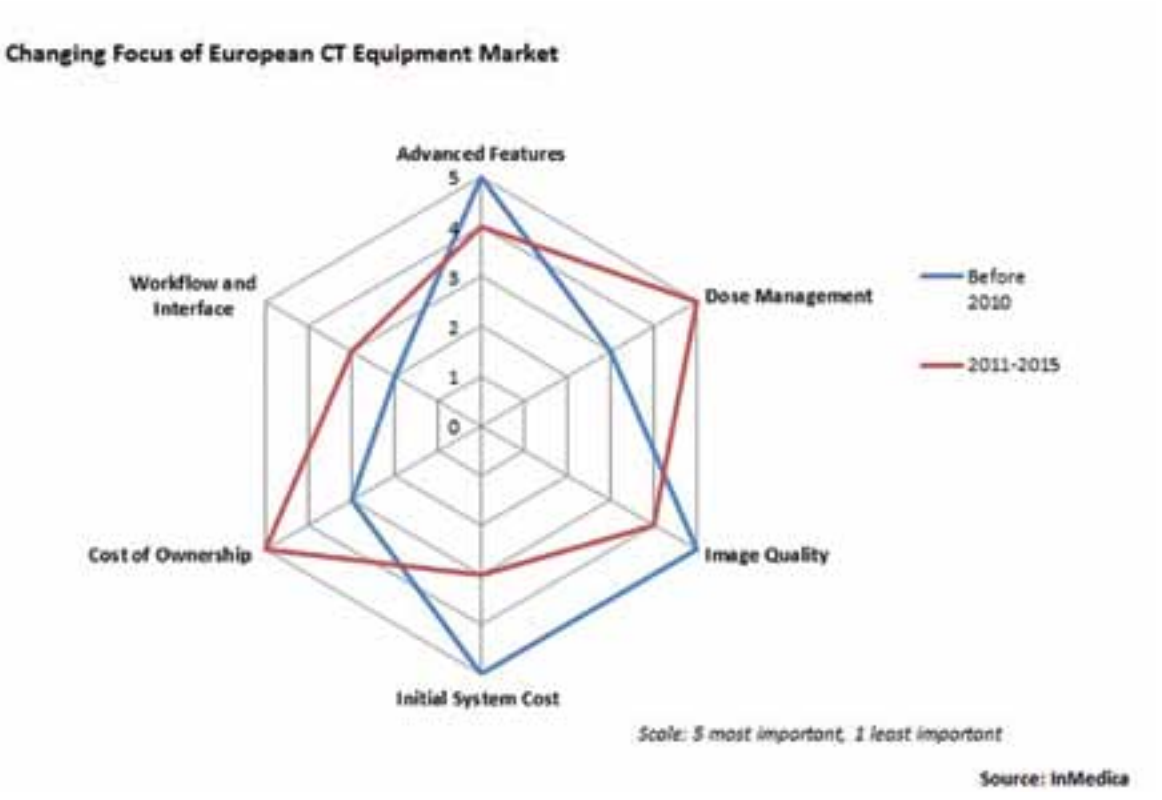
However, it is often in adverse times that the greatest shift in product development and innovation occurs; suppliers are forced not only to focus on advanced features, but also on improving the day-to-day basic equipment use. While many of these innovations rarely make the industry headlines, they bring about significant improvements for the majority of users.

For example, outside of high-end cardiology and research institutions, the majority of CT scans performed will not use advanced visualisation tools or 320-slice scanners. Instead, the real need of the majority is cost-effective CT imaging equipment, incorporating dose management, good resolution and increasingly, efficient workflow and simple integration to existing healthcare IT systems. Recent new system releases from CT suppliers are starting to exhibit such characteristics, highlighting the shift in supplier focus.

Dose reduction remains the hottest topic in CT, with a range of new innovations recently released to help providers track, manage and reduce radiation administered. While many new dose reduction solutions have been brought about through technical changes during scanning, some suppliers are offering other schemes to assist the push for dose reduction. Examples of these strategies include supplier on-site dose reduction assessment and advice, integrated dose management and tracking software and plans to produce a universally applicable scale allowing dose comparison between CT scanner types.

'Workflow' and 'user-interface' are two other terms increasingly common in manufacturers marketing material and have a significant impact on CT use. A big change in the last few years has been facilitating faster scans and post-processing, using faster computer processing, pre-defined user settings and integration with hospital PACS and EMR solutions. Combined, these small improvements make a significant time and cost-saving for users. Moreover, if used with computer modelled throughput management, patient and scan volumes can be increased while reducing costs for the healthcare provider.

Manufacturers are also adapting to the change in users perception of the cost of ownership for advanced imaging equipment. 'Life-time' cost of CT equipment was rarely discussed pre-recession, with advanced features and high resolution images dominating most users' decisions. Yet, with the average life-span of CT equipment in Europe increasing amidst widespread austerity cuts, life-time cost of ownership has rapidly come to the fore.



This trend has led to major changes in service and warranty models, especially as competition for dwindling tender contracts increases. Schemes offering longer equipment warranties, 'wear and tear reduced' imaging modes and more flexible service contracts are intended to reduce the burden of rising advanced imaging service expenditure.

This shift in manufacturers' focus should be welcomed within the radiology community. While some may prefer further advanced diagnostic tools specific for radiological imaging, few would disagree that the new generation of CT equipment are not a step in the right direction for the majority of users. In the short-term, manufacturers of CT equipment will also not benefit significantly from a surge in sales in the uncertain economic climate.

Production of systems that improve the cost of advanced imaging will undoubtedly lead to greater use and more accessible, safer CT systems. That said, manufacturers should also continue to invest in future technology and the next generation of advanced CT systems; pushing the boundaries of imaging technology is key to maintaining the relevance of CT imaging. Finding the correct balance between development of brand new CT technology and refinement of current CT technology is a significant challenge for suppliers. With austerity looking to set in for coming years, it appears the balance will be heavily weighted to the majority of users for the foreseeable future.

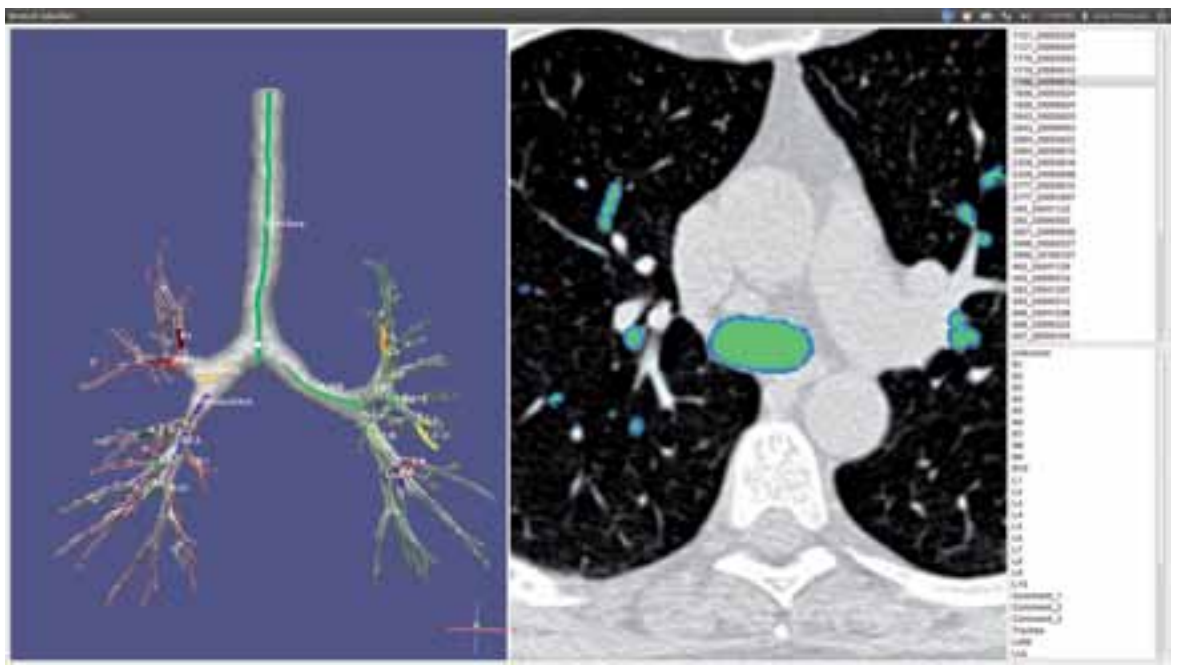
Stephen Holloway is a senior market analyst in the medical imaging research group at InMedica, a division of IHS (NYSE:IHS). InMedica is a provider of market research and consultancy in the medical electronics industry (www.in-medica.com).

EIBIR presents IMAGINE

After last year's success, EIBIR is again hosting the IMAGINE Workshop, under the heading 'Novel technology that shapes radiology'. IMAGINE aims to stimulate interaction between imaging researchers and radiologists. Leading international academic and industrial research groups present their latest developments in medical image analysis and image-guided interventions. During the interactive software demonstration sessions the visitors get hands-on experience with developed techniques and tools. The presenters of the workshops were invited to introduce their work in ECR Today.

An automatic system for segmentation, matching, anatomical labelling and measurement of airways from CT images

By Jens Petersen and Marleen de Bruijne



The branch-labelling tool. Left part shows the airway segmentation with overlaid anatomical names assigned by the method. Right a cross-section at the selected spot on the centreline. The tool allows manual correction of automatically assigned labels.

Lung diseases such as chronic obstructive pulmonary disease (COPD), cystic fibrosis and asthma affect the lower airways, with typical changes including thickened airway walls, narrowed or enlarged airway lumen, and increased mucus production, likely due to inflammatory responses. For accurate diagnosis and patient monitoring it is important to quantify these airway properties using imaging techniques such as CT. Measuring them manually using electronic callipers is very time consuming and the changes are often too subtle to be detected using only a small number of local measurements. Recently developed, fully automated image segmentation methods can extract large parts of the airway tree and allow quantitative assessment of airway wall and lumen properties in three dimensions. However, it is still challenging as the physical properties of the airways vary not only between subjects due to pathology, but also from airway segment to airway segment and from scan to scan due to, for instance, biological, physiological, and inspiration level differences. Moreover, the amount of airway tree found by the extraction methods also varies due to the same reasons. It is thus very hard to establish a good frame of reference in which measurements can be compared between patients, as well as for a patient over time.

At the department of computer science of the University of Copenhagen we have, in cooperation with the department of respiratory medicine at Gentofte Hospital, developed a fully automated framework for reproducible, quantitative analysis of the airways in CT scans. The methods can segment the interior and exterior airway wall surfaces; determine anatomical names of all airway branches, down to and including the segmental level; and match all airway branches in multiple CT scans of the same patient.

The results of the segmentation method have been shown to have few falsely detected branches, good agreement with manual annotations, and can be tuned to phantom data to achieve correct wall thickness measurements.

Using anatomical labels, similar branches have been identified in all images and measures which can thus be compared between patients. Results show that our labelling programme has statistically similar accuracy and precision to medical experts; the system reached 72.7 percent accuracy with 76 percent repeat scan reproducibility on segmental bronchi, versus 71 percent and 72.6 percent for the medical experts. Lobar level branch labels and up were assigned with 94 to 100 percent accuracy. The results can be manually adjusted, if needed, using a developed branch-labelling tool (see illustration). The tool shows three-dimensional visualisation and reformatted cross-sectional views, which allows the user to move through the segmented airway branches and make adjustments to the assigned labels at will.

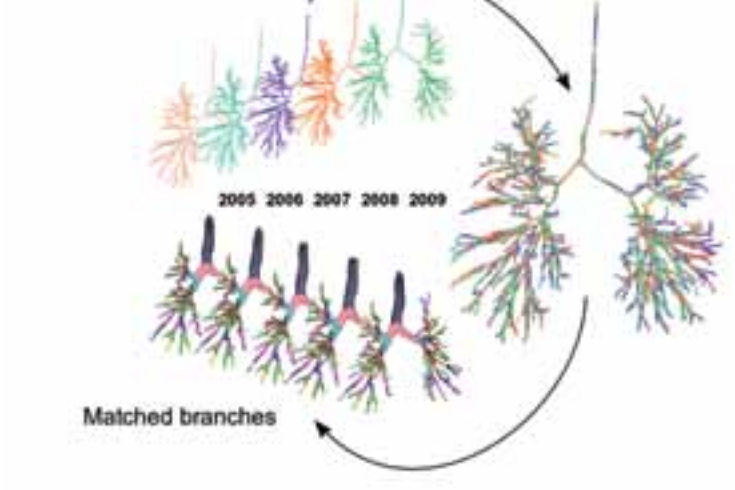
Longitudinal changes in airway dimensions can be tracked over time by matching the airway branches. The approach uses image registration techniques to match airway centrelines in a common coordinate system (see illustration). This significantly increases the reproducibility of measurements.

The framework has been used to evaluate airway properties in all 9,711 low-dose CT scans from the Danish Lung Cancer Screening Trial (DLCST) database. On average 128 branches were found and matched in repeated scans.

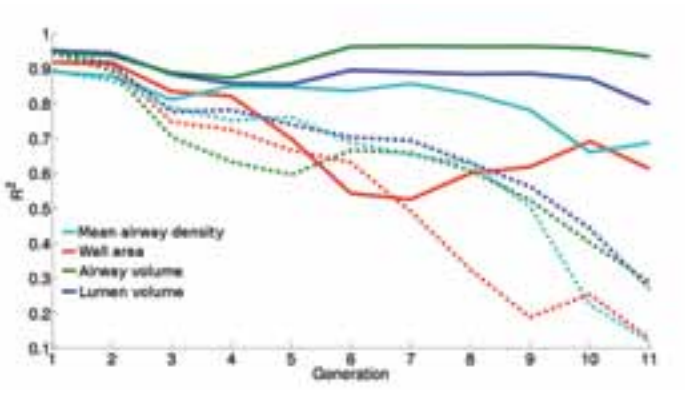
The project will be showcased on Friday, March 8, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level. Additionally some results will be presented as a poster at the ECR, entitled: 'Manual airway labelling has limited reproducibility' (number: 4132) and in a presentation entitled: 'The effect of inspiration on airway dimensions measured in CT images, from the 'Danish lung cancer screening trial' (number: 2706).

Jens Petersen and Marleen de Bruijne work at the Image Group, department of computer science, University of Copenhagen, Denmark. Marleen de Bruijne also works at the Biomedical Imaging Group Rotterdam, departments of radiology & medical informatics, Erasmus MC, Rotterdam, the Netherlands.

All images provided by the department of computer science at the University of Copenhagen, Denmark.



Extracted centrelines are transformed to a common coordinate system using image registration, in which the branches are matched based on distance and angle. The matches are then transferred to the surface segmentation.



Reproducibility of airway measurements in different airway generations evaluated in all (dotted lines) and matched airways (complete lines). Matching is seen to increase reproducibility.

It's show time again!

Don't miss the sixth Post-Processing Face-Off Session at ECR 2013

By Anno Graser

Did you go to last year's workstation Face-Off Session? If so, then you probably enjoyed the exciting atmosphere, as well as the unique opportunity to see expert radiologists use the latest and best post-processing gadgets on the market to work on real clinical cases.

This year, several major equipment manufacturers were again invited to participate in this interactive session, and we are pleased to announce that six major vendors have accepted the challenge of participating in the Face-Off Session. In order to cover a wide spectrum of post-processing demands, we have selected two very distinct cases. The first case is a patient presenting with advanced malignant melanoma and multiple pulmonary metastases, who underwent CT scans of the chest, abdomen and pelvis separately over a period of time. Tasks will include demonstrating how computer-aided detection software helps to find and count lung nodules, and ascertaining the volumetry of selected metastases over time. Relevant clinical information about the course of the disease under treatment can be gathered from these parameters.

The second case is a patient with an intermediate cardiovascular risk-factor profile, suffering from recurrent episodes of atypical chest pain. A coronary CT angiography dataset, cardiac rest and stress-MRI perfusion, and cine-MRI functional series have been carried out. For the first time, participants in the Face-Off Session will have to deal with CT and MRI datasets from the same patient, a situation that every radiologist knows from their daily practice; however, we all know that it is difficult to achieve a comprehensive simultaneous read of examinations acquired with different imaging modalities.

Both cases offer ample opportunity to apply state-of-the-art post-processing technology. Skilled hands operating the computer mouse are also essential, as there will be no more than five minutes per case for each presenter; five minutes to bring out the best in their machines.

Image datasets, as well as post-processing objectives, were provided to the participating vendors four weeks prior to ECR 2013. Vendors were asked to invite an expert of their choice to present these cases on the podium.

Over the last few years, the Face-Off Session has grown into a well-established highlight of the ECR programme and the number of session participants is growing steadily. We hope you will not miss this unique opportunity to see leading imaging experts use the latest post-processing technology to examine great cases. Where else would you find an opportunity to see so much different equipment in such a short time? As one of the organisers and moderators of the session, I cordially invite you to attend our session. See you in room B at 8:30 on Friday, March 8.

Professor Anno Graser works at the Department of Clinical Radiology, University of Munich – Grosshadern Campus.

Friday, March 8, 08:30–10:00, Room B

6th Post-Processing Face-Off Session

Chairman: A. Graser; Munich/DE
Co-chairmen: M. D'Anastasi; Munich/DE
F. Schwarz; Munich/DE
Vendors: aycan
GE Healthcare
Philips Healthcare
Siemens
TeraRecon
Vital Images

#ECR2013B

EIBIR Sessions at ECR 2013

Friday, March 8, 08:30–10:00, Room N/O
EIBIR/EORTC (European Organisation for Research and Treatment of Cancer) Symposium
A radiologist with a ruler in his hand is a dangerous person: seeking standardisation in multicentre imaging trials
Moderators: P. Brader; Vienna/AT
Y. Liu; Brussels/BE

- **Introduction: Who, what, why, outcome at the end of the symposium**
  Y. Liu; Brussels/BE
- **Setting up clinical trials with functional imaging endpoints: trials and tribulations**
  N. de Souza; Sutton/UK
- **Challenges, problems on key imaging techniques**
  B. van Beers; Clichy/FR
- **Advanced MR neuroimaging in multicentre trials: experience from the EORTC Brain Tumour Group**
  M. Smits; Rotterdam/NL
- **Presentation of LUNG study: from the beginning until today**
  U. Nestle; Freiburg/DE
- **Discussion, Questions and Answers**

Saturday, March 9, 10:30–12:00, Meeting Room 14, 1st Level
EIBIR/EuroAIM Session
Evidence-based radiology
Moderators: F. Sardanelli; Milan/IT
M.G.M. Hunink; Rotterdam/NL

- **Systematic reviews and meta-analyses in radiology**
  G. Di Leo; Milan/IT
- **Guidelines in radiology**
  L.M. Sconfienza; Milan/IT
- **Clinical decision support for the safe and effective use of imaging tests**
  M.G.M. Hunink; Rotterdam/NL
- **Preoperative breast MRI: the MIPA study**
  R.M. Trimboli; Milan/IT
- **Discussion**

Saturday, March 9, 12:45–14:15, Room Z
EIBIR Session
Horizon 2020 – Setting the scene for Europe's next research programme
Moderators: G.P. Krestin; Rotterdam/NL
J. Hennig; Freiburg/DE

- **Horizon 2020: setting the scene – insight into Horizon 2020 health priorities, including the research infrastructure perspective**
  K. Berkouk; Brussels/BE
- **IMI – How to speed up the development of better and safer medicines for patients**
  E. Vaudano; Brussels/BE
- **Public private partnerships as a booster for research and economic growth in the future**
  N. Denjoy; Brussels/BE
- **The role of imaging in health research in the era of Personalised Medicine**
  L. Martí-Bonmatí; Valencia/ES
- **How EIBIR supports biomedical imaging scientists in their grant applications and research management**
  J. Hennig; Freiburg/DE
- **Questions/Answers**

Saturday, March 9, 16:00–17:30, Room Z
Euro-BioImaging
Towards implementation of a pan-European imaging infrastructure
Moderator: J. Hennig; Freiburg/DE

- **Euro-BioImaging – Towards implementation of a European open access imaging research infrastructure**
  J. Hennig; Freiburg/DE
- **Making the case: development of a node for UHF-MRI**
  O. Speck; Magdeburg/DE
  J. Hennig; Freiburg /DE
- **Potential of Phase-Contrast Imaging as a node within Euro-BioImaging**
  F. Bamberg; Munich/DE
- **Discussion**

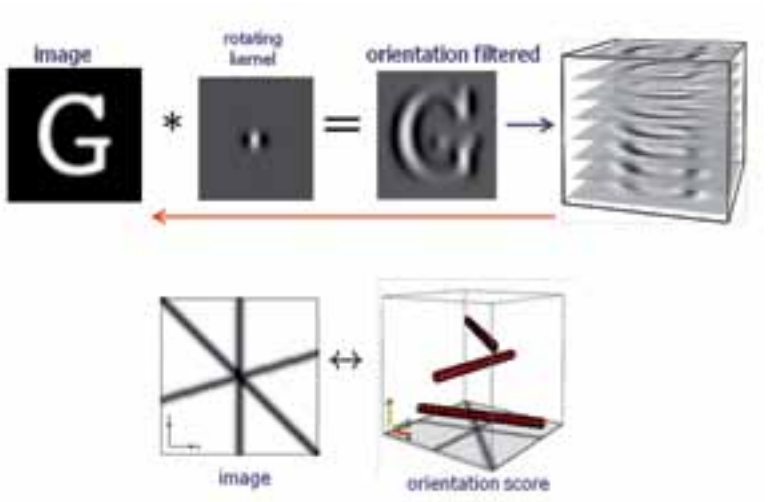
Innovative algorithms for image analysis and complex data visualisation at Eindhoven University of Technology

By Bart ter Haar Romeny, Remco Duits, Roy van Pelt, Tos Berendschot, Erik Bekkers, Luc Florack, Hans van Assen, Ralph Brecheisen, Anna Vilanova

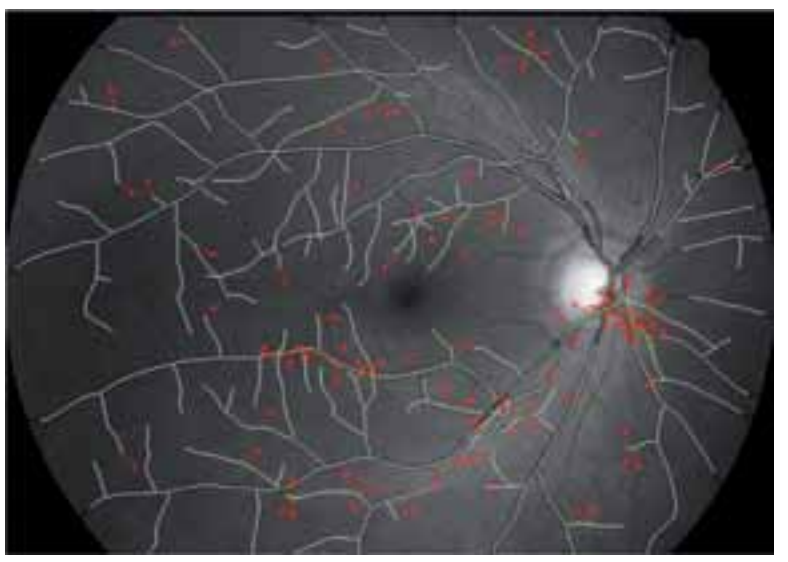
Humans have an incredible faculty for pattern recognition, even in very complex conditions where only partial information is available. We need ever more advanced computer algorithms to assist us in diagnosis, quantitative tasks and visual interpretation. Radiological images have also become more and more complex in terms of vector (velocity), tensor value (diffusion weighted), dimensionality, size and numbers. The need for automation has also increased due to the growth of screening applications.

The design of innovative and highly effective algorithms in medical image analysis can be inspired by functional brain mechanisms. Optical brain imaging techniques in experimental animals have revealed much of the detailed functional structure of the early stages of the visual system in the brain, at cellular level. With voltage sensitive dye techniques and two-photon calcium fluorescence techniques we can now see the brain in action, using the simultaneous recording of hundreds or thousands of firing cells.

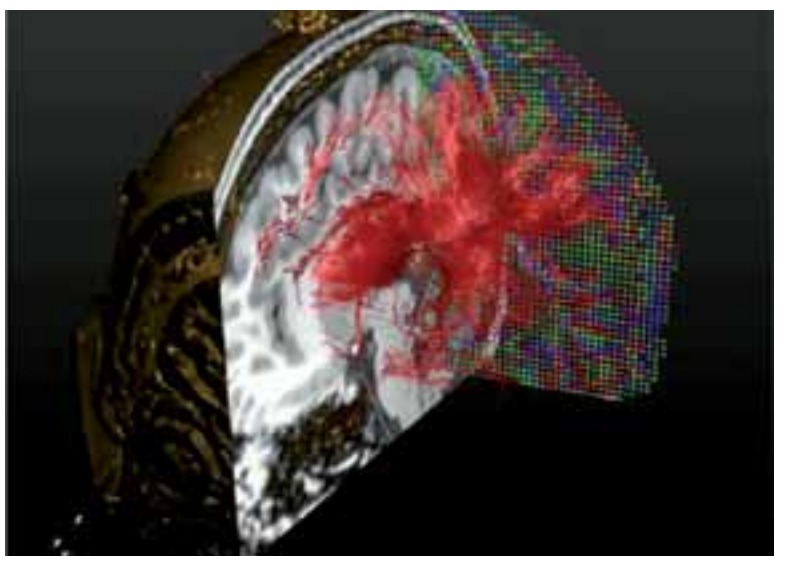
There is some amazingly well-organised machinery at work within the human body. It starts in the retina, which is actually a camera working at a wide range of resolutions (multi-scale), with separate sets of ganglion cells for motion detection and shape detection. The retina projects onto the visual fields in the cortex, and is mapped in so-called 'pinwheel' orientation columns. It is extremely precise: for every pixel we see, a large set of cigar-shaped filters checks every orientation around this pixel to see if there is something elongated, like a contour, a blood vessel, or a catheter. The filters are connected, and we have now begun to understand how contextual operations work, which have been very difficult to model. In fact, for each incoming image the brain creates a much larger image, a stack of images and each one is dedicated to a particular orientation. Amazingly, the same seems to be true for the detection of velocities, spatial frequencies, sizes (scale), disparities (depths) and colours. We need large parallel computers to carry out the same visual tasks as the brain, which is now feasible.



Multi-orientation filters, modelled from the pinwheel structures in the human visual cortex can deal with multiple orientations from one pixel by pulling them apart.



Fully automatic and robust tracking of retinal vessels in screening for diabetic retinopathy is now feasible, despite low contrast, bifurcations, high curvature, and crossing vessels.



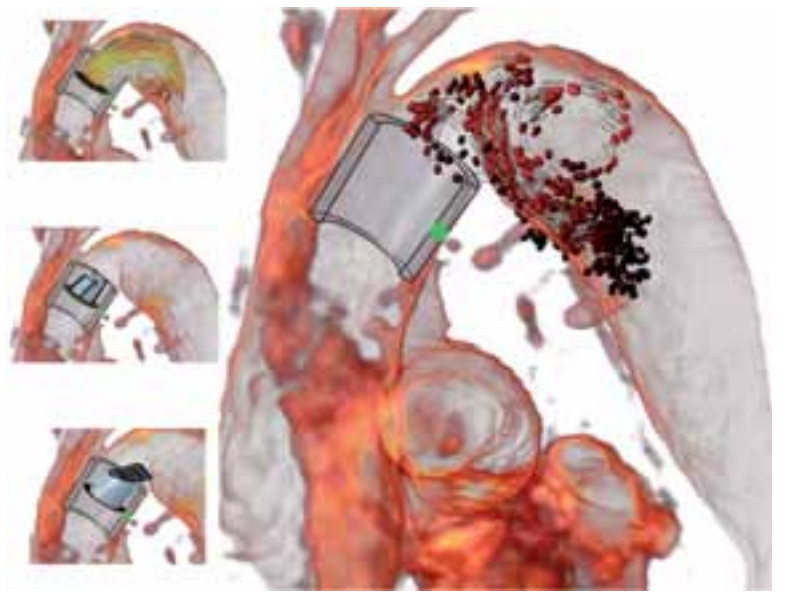
Real-time visualisation and exploration of high-volume diffusion MRI tractography data.

Based on these recent neurophysiological insights into brain functionality, researchers at Eindhoven University of Technology have developed an advanced mathematical toolbox for effective and quantitative CAD. The multi-orientation algorithms have been particularly successful in diffusion MRI tractography enhancement, especially in cases where brain fibres cross and where traditional methods often fail. Another important application is in vessel tracking, dealing with bifurcations and crossings. In particular, the analysis of the retinal vasculature for large-scale screening of diabetic retinopathy can now be fully automated.

Multifrequency algorithms have successfully been exploited in quantitative image analysis of 3D motion and deformation fields of ventricular contraction from MRI tagging sequences, enabling a non-invasive delineation of the infarcted area in cardiac cine-MRI.

For today's complex and high dimension acquisitions, such as 3D-cine MRI blood-flow velocity fields, effective interactive and explorative visualisation is essential for clinical research. Modern consumer graphics technology, as used for PC games, allows for fast visualisation and parallel complex computations. High-dimension data, such as the vector-valued 3D-cine blood-flow fields can now be visually analysed interactively.

There is an increasing interest in visual uncertainty: the whole pipeline of image acquisition may have many sources of variation, commonly represented by error bars. At Eindhoven University of Technology, researchers are pioneering the inclusion of this information on uncertainty into a scientific visualisation of complex anatomy or function, in particular for complex multi-valued and multi-dimensional data.



Interactive 3D visualisation of 3D-cine MRI blood-flow fields. Seed points in a manually placed probe (tube) can be followed over time, exhibiting vortices in the aortic arch.

The project will be showcased on Friday, March 8, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

Website for publications and more examples: bmia.bmt.tue.nl

The authors are from BIOMIM – Biomedical Image Analysis, Department of Biomedical Engineering, Eindhoven University of Technology, the Netherlands.

All images provided by BIOMIM – Biomedical Image Analysis, Department of Biomedical Engineering, Eindhoven University of Technology.

Novel technology that shapes radiology: EIBIR presents IMAGINE

Quantitative image analysis

Friday, March 8, 14:00–15:30, EIBIR IMAGINE Theatre, Room U

Oral presentations

- **Moderators:** EIBIR IMAGINE committee*
- **An automatic system for segmentation, matching, anatomical labelling and measurement of airways from CT images**
  J. Petersen; Copenhagen/DK
- **New algorithms for quantitative image analysis inspired by functional brain mechanisms**
  B.M. Ter Haar Romeny; Eindhoven/NL
- **Patterns in radiology: spatio-temporal image analysis in research and clinical application**
  G. Langs; Vienna/AT
- **QuantaVita for clinical practice: fully-automated quantitative MRI with normative ranges**
  A. Cherubini; Catanzaro/IT
- **BrainCON: graph theory based multimodal brain connectivity analysis and visualisation software; BrainMOD: multi-purpose software for 4-dimensional multimodal medical image analysis**
  T. Spisák; Debrecen/HU
- **The 3DSlicer open-source platform for segmentation, registration, quantitative imaging and 3D visualisation of biomedical image data**
  S. Pujol; Boston, MA/US

Friday, March 8, 15:30–16:30, Room U
Saturday March 9, 12:00–13:00, Room U

Software demonstrations 'Quantitative image analysis'

* EIBIR IMAGINE committee to chair the oral presentations:
Marleen de Bruijne; Rotterdam/NL & Copenhagen/DK, Mari Cruz Villa; Barcelona/ES, Sune Darkner; Copenhagen/DK, Jan Klein; Bremen/DE, Emanuele Neri; Pisa/IT, Christine Tanner; Zurich/CH, Eva van Rikxoort; Nijmegen/NL

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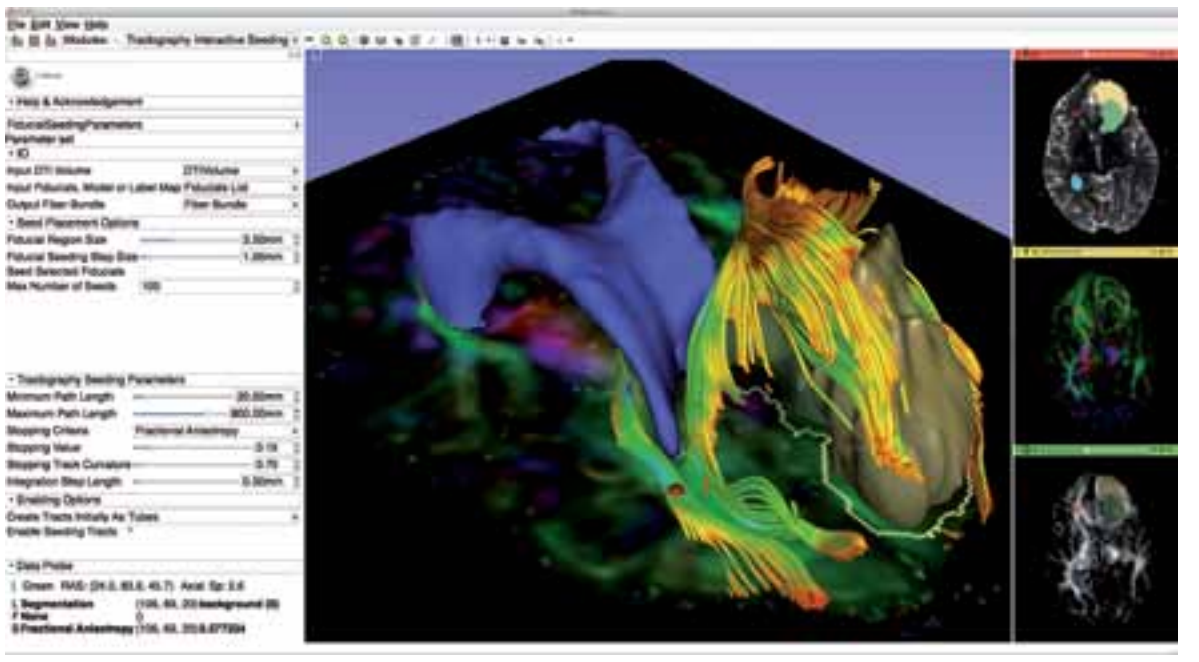
Answers for life.

3D Slicer: a freely available software platform for translating new concepts into clinical research tools

By Sonia Pujol, Steve Pieper, Kemal Tuncali, Tobias Penzkofer, Andriy Fedorov, Junichi Tokuda, Sang-Eun Song, Fiona Fennessy, Nobuhiko Hata, Clare Tempany, Ron Kikinis



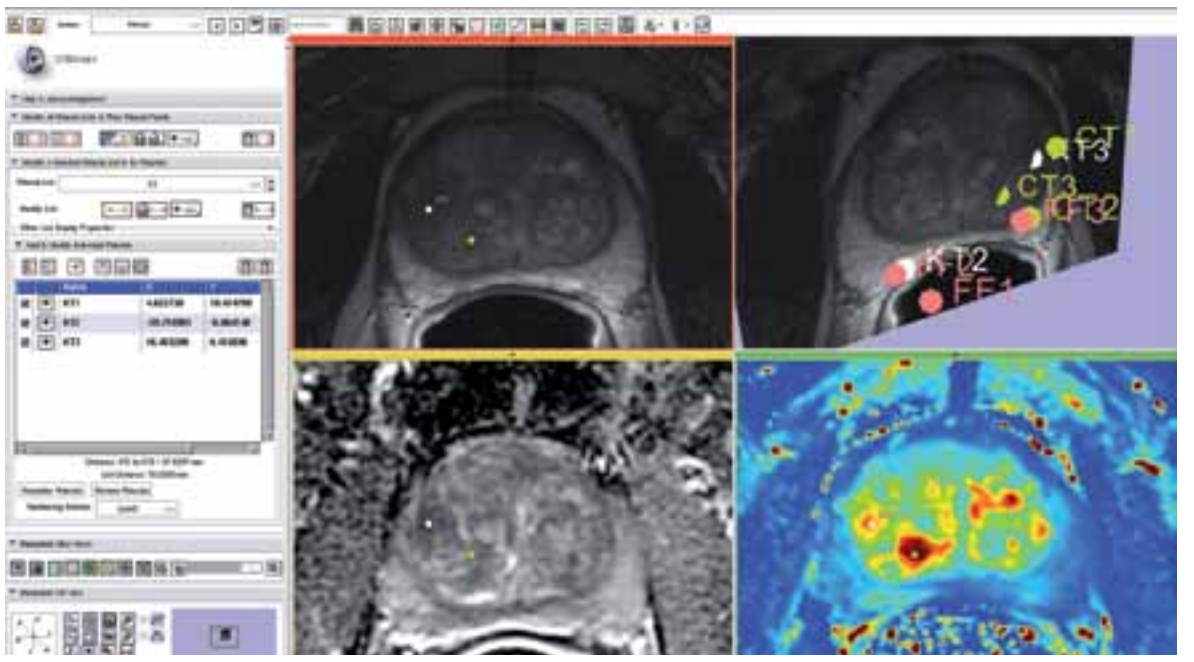
White matter exploration of peritumoural tracts for neurosurgical planning in 3D Slicer. The image shows the user interface of the tractography interactive seeding module (left). Peritumoural white matter tractography reconstructions are fused with 3D surface models of the solid and cystic part of a glioblastoma multiform (centre). Axial, sagittal and coronal viewers show the baseline, colour by orientation, and fractional anisotropy map computed from the diffusion-weighted MRI volume (right).

Medical image computing is rapidly becoming a critical component of radiological workflows as the volume and complexity of imaging data continues to grow. Against this backdrop, the research and development into novel ways to analyse medical imaging data is of increasing importance. The highly multidisciplinary aspect of radiological research in imaging science is both a strength and a challenge for the field because of the need for effective communication among scientists with backgrounds as diverse as medicine, physics, mathematics, and computer science. Bridging the communication gap requires a collaborative environment that fosters an exchange of specialised knowledge and expertise. Therefore, the development of medical image computing tools requires a software environment that is both easy to use for clinical end-users and easy to extend for developers. In practice, research projects often start with technological prototypes that demonstrate the feasibility of a new concept, and the transition into tools usable by trained clinical researchers requires a significant engineering effort.

The 3D Slicer software platform was developed to address this challenge by providing clinicians and scientists with a common software platform for the development of biomedical image analysis tools. Begun 16 years ago as a master's thesis by David Gering, the 3D Slicer project has evolved into an open-source platform distributed under a BSD-style license and used in clinical research worldwide. Today, 3D Slicer is supported by a multi-institution effort and several large scale grants funded by the U.S. National Institutes of Health. In addition, funding from several other countries contributes to some aspects of the software. The 3D Slicer platform is not FDA approved or CE marked, and is for research use only.

The 3D Slicer platform provides clinical researchers easy access to advanced image analysis tools that can be run on their Windows, Mac or Linux laptop computer with their own data. The software integrates standard radiological viewing capabilities for MR, CT, PET and Ultrasound data in multiple image file formats, including DICOM, and provides advanced 3D visualisation functionalities such as surface rendering and GPU-based volume rendering. It integrates over 100 modules with state-of-the-art tools for filtering, segmentation, registration, and quantitative analysis of multimodal imaging data, as well as tool tracking and real-time data fusion for image-guided interventions.

The 3D Slicer platform provides computer scientists and biomedical engineers with a flexible programming environment for rapid development in C++ or Python of scripted, command-line and loadable shared library modules. The extensible architecture of the software allows the development of specialised packages such as SlicerRT for radiotherapy research, and SlicerIGT for image-guided therapy.



Preprocedural target definition for MRI guided biopsy in 3D Slicer. Target points of the different readers can be visualised in the multiparametric imaging (top left: T2W, top right: 3D-MPR, bottom left: ADC-Map, bottom right: pkMap)

A training compendium of more than 80 tutorials with precomputed datasets has been developed on a wide range of topics such as 3D visualisation, image segmentation, image registration, MR diffusion tensor imaging and image-guided therapy. The tutorials are equally suited to clinicians and scientists, strengthening communication among these communities through the use of a common vocabulary. The compendium also includes programming tutorials on how to extend the software. The 3D Slicer community has been fostered through the delivery of over 75 hands-on end-user and developer workshops that have attracted more than 2,300 clinicians and scientists at international conferences and academic institutions around the world.

The 3D Slicer software platform enables applied science to be oriented towards specific subject analysis in the presence of pathology. The work of Tuncali et al. presented at the IMAGINE session at ECR 2013 is an example of the use of 3D Slicer in enabling translational clinical research. In that project, 3D Slicer was used to perform intraprocedural image registration during MR-guided prostate biopsies. Other demonstrations of 3D Slicer use by Pujol et al. at the IMAGINE session include registration-based adaptive radiotherapy and interactive exploration of peritumoural white matter fibres using DTI tractography.

The platform is based on an international open science effort to provide clinicians and scientists with a flexible software environment to foster innovation in medical image computing. The software, tutorials and datasets are available at www.slicer.org.

The project will be showcased on Friday, March 8, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level. Additional 3D Slicer presentations at ECR 2013 include 'Organ shift correction during MRI-guided prostate biopsy: utility of intraprocedural image registration' by Fedorov et al. (Poster) and 'The 3D Slicer open-source platform for segmentation, registration, quantitative imaging and 3D visualisation of biomedical image data' by Pujol et al. (Oral Session SS 205, March 7, 14:00–15:30).

Part of this work is funded by the National Institutes of Health through the following grants: U54EB005149 (NA-MIC), P41RR013218 (NAC), P41EB015898 (NCIGT), R01 CA111288 and U0CA151261.

The authors are from Brigham and Women's Hospital, Harvard Medical School, Boston, MA, United States.

All images provided by Brigham and Women's Hospital, Harvard Medical School, Boston, MA, United States.

Total number of downloads of 3D Slicer version 4 since its release in November 2011.

New look for EIBIR online

By Alena Morrison

As a service organisation for scientists, run by scientists, the European Institute for Biomedical Imaging Research (EIBIR) offers a variety of networking and project management services attuned to the needs of its network members.

Whether you are interested in becoming actively involved in European working groups, have a groundbreaking scientific project idea but not enough time or human resources to implement it, or need to improve your project outcomes through a dedicated communication strategy – EIBIR's expert team is able to offer their professional guidance and support in a wide variety of areas.

Dedicated to the coordination of biomedical imaging research, EIBIR disseminates knowledge and coordinates and supports the development of biomedical imaging technologies. EIBIR also supports networking activities in research and plays a central role in spreading good practice, promoting common initiatives and interoperability in the field of biomedical imaging research.

The services page

To better convey the full suite of services that EIBIR offers to its members and provide visitors with more straightforward access to the content, the new EIBIR website went live at the end of 2012. After a lot of hard work behind the scenes, updates to EIBIR news are easier to read and the content has a more straightforward layout. Additionally, more visuals have been added to showcase the research undertaken by EIBIR members.

The website will continue to be a work in progress as updates about news, funding calls and consultations will be added as they arise – ensuring network members stay informed about upcoming opportunities and are able to utilise EIBIR's well-attuned core research-related services to achieve successful research results. Examples of project-related services offered by EIBIR including: proposal preparation, contract negotiation; EC reporting; financial management as well as communication and dissemination.

EIBIR projects

In addition to project-related services, EIBIR also offers various member services: meeting organisation; members' database and events calendar.

Always available on the website is information about EIBIR coordinated projects: those that wrapped up in 2012 (ENCITE, HAMAM, PEDDOSE.NET); those that will continue into 2013 (EuroBioImaging, two COST Actions); and the two that have started last month (VPH_PRISM, VPH-DARE@IT).

To learn more about the services offered by EIBIR, or details about how to become a member, please visit the EIBIR Booth at ECR 2013 (located in the entrance hall) or take a look at the new website www.eibir.org.

INSIDE TODAY

Another productive year for the ESR

By Gabriel P. Krestin, ESR President

I wrote in yesterday's edition of *ECR Today* about the ESR's recent focus on strengthening international relations and the importance of our ties with other societies throughout the world. But just as important are our relationships within Europe and the consolidation of what we have achieved so far within our community. The ESR Executive Council had a very productive brainstorming meeting with the ESR's institutional member society representatives, in The Hague in June, as well as further meetings in Milan in October, and the regular ESR Annual Leadership Meeting with over 140 participants in Amsterdam. One particularly pleasing outcome of these meetings has been intensified dialogue with national societies, as well as subspecialty and allied sciences societies in Europe. Their impact on ESR policies will be substantial in the coming years. In the same spirit, the establishment of a concept introduced by ESR Past-President, András Palkó has further improved communication with our membership. The idea was to assemble a pool of young, up-and-coming professionals in the field of radiology, upon whom the Executive Council could call for opinions, suggestions and feedback, and who would gain valuable experience in interacting with the ESR committees while becoming acquainted with the structure and processes of our organisation. Originally dubbed the 'Resonant Body', this has now been renamed the 'Leadership Institute' and has already proven very valuable as a sounding board. An online communication forum has been set up with this group and they will be very important in determining future directions for the ESR.


Gabriel P. Krestin
ESR President

Some of the ESR's most important creations have enjoyed a very successful 2012. The European School of Radiology (ESOR), which celebrated its fifth anniversary at ECR 2012, has gone from strength to strength under the stewardship of Nicholas Gourtsoyiannis, welcoming an ever increasing number of students and fellows onto its many courses and programmes. The European Institute for Biomedical Imaging Research (EIBIR) has also flourished during its sixth year, attracting vital funding for research and coordinating various projects under the European Commission's 7th Framework Programme. Three major projects, Peddose.net, HAMAM, and ENCITE, have been successfully completed this year and a number of others are still in progress. At the same time, the European Board of Radiology, in its second year of existence, has become firmly established as a recognised body for radiological certification and accreditation in Europe. The increasing profile of the European Diploma in Radiology (EDiR) and its acceptance and acknowledgment by national, subspecialty and allied sciences societies has confirmed the EBR's legitimacy. Everyone at the ESR and EBR has been extremely pleased to see the reputation of both the board and the diploma grow in Europe and beyond, and we are all looking forward to reaping the long-term rewards of our efforts to harmonise qualification standards across Europe.

The content of the EDiR examination is based on the ESR's European Training Curriculum, and we are currently in the final stages of updating the curriculum to make it both more comprehensive and easier to understand. The new version, which at the time of writing is still subject to feedback from the subspecialty societies, will describe not only knowledge, but also the skills, competences and attitudes required at each level of training. One particularly important change is that the key stages will be given new, simpler names, to avoid any confusion with previous editions of the curriculum. The first three years of common trunk radiological training will be referred to as 'Level 1' and the final two years of subspecialty interest training will be 'Level 2'. The final document should be completed by the time we meet in Vienna.

Last, but by no means least, the ESR'S publications have continued to provide an exceptionally high level of quality this year. *European Radiology* has enjoyed an extremely successful six-year period under the editorship of Adrian Dixon, and will soon enter a new phase under a new editor-in-chief, who will be formally announced at the ECR.

With all of these activities and developments in mind, I am very much looking forward to seeing what the next twelve months will bring for the ESR, for our members, and for the world of radiology in general.

Dedicated researcher and teacher delivers today's Honorary Lecture

By Michael Crean

In recognition of his research and work in the areas of cardiovascular imaging and interventional radiology, Professor Carlo Catalano from Rome, Italy, has been invited to present the Josef Lissner Honorary Lecture, entitled 'MR-guided focused ultrasound: a new string to the radiologist's bow', at ECR 2013.

Carlo Catalano is professor of radiology and head of the department of diagnostic radiology at La Sapienza University of Rome Hospital.

Born in Rome in 1965, Prof. Catalano received his medical degree from La Sapienza University of Rome in 1990 before completing his residency at the University of L'Aquila in 1994. Up until 1999, he worked as a staff radiologist in the department of radiology and the department of emergency radiology at La Sapienza University of Rome. During this time he focused mainly on CT and MR body imaging along with cardiovascular imaging and interventional procedures. In 1999, he became assistant professor of radiology at La Sapienza, as well as assistant professor at the Campus Bio-Medico University, Rome.

Throughout his career, Prof. Catalano has dedicated much of his time to research and education. He became full professor of radiology at La Sapienza University of Rome in 2010, after eight years of teaching and research as associate professor. He serves as the Italian delegate to the European Society of Radiology's Education Committee and has served as a member of the European School of Radiology's faculty for its Teach-the-Teachers programme in Italy, which reflects his experience and passion for the field of radiological education and training.

Prof. Catalano has been an active member of the ESR since the beginning of his career, participating as a panellist and as an organiser for the Junior Film Reading Session at ECR 1999. Furthermore, during his career he has shown great dedication to furthering relations with less developed countries, with the aim of sharing radiological knowledge.

"When I received the invitation from Prof. Bilbao, President of ECR 2013, to give an Honorary Lecture, after a few moments of pride I started thinking what I had done during my career to deserve it; I'm aware I have received from radiology more than I have given, but at the same time I feel I always served the radiology community with enthusiasm and dedication," Catalano remarked.

A prolific author and researcher, Prof. Catalano has authored more than 170 scientific papers, six books and upwards of 50 book chapters. On top of this, he has delivered more than 150 invited lectures at national and international conferences.

"What makes me feel honoured and a little bit sad is that the lecture is named in honour of Josef Lissner, who I had the chance to meet at the beginning of my career; he was a role model, a real leader and pioneer in modern radiology. Giving a lecture named after Josef Lissner is a source of pride and above all an opportunity to give even greater commitment to radiology and the ESR."


Professor Carlo Catalano from Rome, Italy

Friday, March 8, 12:15–13:15, Room A

Josef Lissner Honorary Lecture

MR-guided focused ultrasound: a new string to the radiologist's bow

Carlo Catalano; Rome/IT

ESR Gold Medal awarded to exceptional interventional radiologist

By Michael Crean

In recognition of his scientific achievements and his dedication to international exchange and cooperation in the field of radiology, Professor Johannes Lammer from Vienna, Austria, will be awarded the Gold Medal of the European Society of Radiology at ECR 2013.

Johannes Lammer is vice-chairman of the department of radiology and director of cardiovascular and interventional radiology at the Medical University of Vienna, Austria.

Born in Vienna, Prof. Lammer studied at the University of Vienna Medical School, where he graduated in 1975, before moving on to work as an intern at hospitals in Bregenz and Feldkirch. He then went to Graz, to complete his residency in radiology at Karl Franzens University. In 1982, he travelled to the United States, where he held visiting fellowships at the department of radiology, University of Pennsylvania, the MD Anderson Hospital and Tumor Institute at the University of Texas in Houston, and the department of radiology at the University of California in San Francisco. In 1984, he took up the post of associate professor of radiology at Karl Franzens University, Graz. In 1990, he became head of the department of angiography and interventional radiology at the University of Vienna.

Professor Johannes Lammer from Vienna, Austria

On top of this impressive academic and clinical career, Prof. Lammer has also been very active in the field of international scientific collaboration and exchange. From 1996 to 1997, he served as president of the International Society of Hepato-Biliary-Pancreatic Radiology, followed by presidency of the Austrian Society of Angiology, from 1999 to 2000. A long-standing, active and highly valued member of the Cardiovascular and Interventional Radiological Society of Europe, he has served as its treasurer, secretary and president, which exemplifies his dedication to promoting international cooperation within the field of interventional radiology.

As an author, Prof. Lammer has published more than 300 articles in peer-reviewed journals such as *Radiology, Circulation, The Lancet* and the *New England Journal of Medicine*. He has also written a number of abstracts and book chapters, as well as a book, *Praxis der Interventionellen Radiologie* (The Practice of Interventional Radiology). His research interests include CT and MR angiography of coronary and peripheral arteries, IR treatment of peripheral vascular and aortic diseases, as well as HCC and liver metastases.

As a result of his work, Prof. Lammer has received a number of awards and honours throughout his career, including honorary membership of the Austrian Society of Radiology, the Austrian Society of Interventional Radiology, the Hungarian Society of Interventional Radiology and the Turkish Society of Radiology. He has also received Honorary Fellowship of the British Society of Interventional Radiology and the Gold Medal of the Cardiovascular and Interventional Radiological Society of Europe.

"The Gold Medal of the ESR is a very special honour which I appreciate very much indeed. I certainly realise that many other European radiologists deserve this honour as well. It was a great pleasure to work with the ECR in its early days and compile programmes in vascular and interventional radiology, and start the interventional video workshop which has been running for many years," Prof. Lammer stated. "I see the honour as an appreciation of interventional radiology within the house of radiology. Interventional radiology is very different nowadays: the days when a patient was referred with a piece of paper in his hand are gone. Now the IR has the responsibility for the patient from the indication to the longitudinal follow-up."

Celebrated European visionary awarded ESR Gold Medal

By Michael Crean

In recognition of years of groundbreaking work in clinical radiology and his devotion to fostering cooperation on a European and international level, Professor Maximilian F. Reiser from Munich, Germany, will receive the Gold Medal of the European Society of Radiology, at ECR 2013.

Maximilian F. Reiser is professor of radiology, chairman of the department of clinical radiology, and dean of medicine at Ludwig Maximilians University of Munich.

In 1973, Prof. Reiser received his medical degree from the Ludwig Maximilians University of Munich, the very same institution he now heads. He then completed his residency at the diagnostic radiology department of the Technical University of Munich in 1983. He later served as an assistant professor at the same institute, before moving on to become an associate professor at the University of Münster in 1986. He then went on to take up the post of professor and chairman of radiology at the University of Bonn in 1989, where he worked until he returned to his alma mater in 1993. He has served as professor and chairman of Ludwig Maximilians University's department of radiology since 1993, and in 2008 he was appointed dean of medicine.

A well-known figure within the international radiological community, Prof. Reiser has taken an active interest in promoting and furthering the interests of his discipline. A long-time and active member of the European Society of Radiology, he served as president of the society's congress in 2008, and went on to serve as president of the society in 2010–2011. He has also served as president of the German Radiological Society, the European Society of Musculoskeletal Radiology and the joint congress of the German Radiological Society and Austrian Radiological Society in 2001.

With more than 500 original publications to his name, Prof. Reiser has proven to be a productive author throughout his distinguished clinical and academic career. His main research interests include skeletal radiology, magnetic resonance imaging, abdominal and cardiac imaging, as well as oncologic interventions. Among the many awards he has received throughout his career, are Honorary Fellowship of the Royal College of Radiologists and the American College of Radiology. He was also awarded the Holthusen Ring Award of the German Radiological Society. Prof. Reiser is also an honorary member of many national radiological societies, including the national radiological societies of Austria, France, Switzerland, Korea, Greece, Japan, India and Iran, as well as being an honorary member of the Radiological Society of North America. He has also received honorary membership of the *Leopoldina,* the German National Academy of Science, as well as an honorary doctorate from the veterinary faculty of Ludwig Maximilians University and Tiflis State University. He was also made Foreign Associate of the National Academy of Science (USA) Institute of Medicine (IOM).

"I consider myself as privileged to have witnessed the reunification of Germany and Europe allowing for friendly relations with radiologists from across Europe. The ESR being an international organisation allowed me to establish amicable connections with colleagues from all over the world," Prof. Reiser said. "Josef Lissner, founder of the modern ECR, was my predecessor at the radiology department in Munich and became a close friend. For me, he was a greatly admired role model who fostered my enthusiasm for the European idea and the vision of a common European radiology organisation.

Professor Maximilian F. Reiser from Munich, Germany.

For me, ESR is an exceptional society with great visions and the most innovative ideas. I was happy to cooperate with outstanding and visionary leaders in radiology, gifted scientists and the wonderful team at the ESR Office."

Distinguished thoracic radiologist and dedicated teacher receives ESR Gold Medal

By Michael Crean

In recognition of his many years of dedication to radiological education and training, as well as his tireless efforts to promote the discipline of radiology in Europe and around the world, Professor José Cáceres from Barcelona, Spain, will be awarded the Gold Medal of the European Society of Radiology at ECR 2013.

José Cáceres is a professor and former head of diagnostic radiology at H.G.U. Vall d'Hebron Universidad Autonoma, Barcelona, Spain. He is also a long-standing member of the ESR and is well-known for his series on the ESR blog, 'Cáceres' Corner,' in which he and his puppet colleague challenge radiologists to solve specific cases and take away some important lessons.

Prof. Cáceres was born in Seville, Spain in 1940. He studied medicine at the University of Seville from 1957 to 1964, before moving to the United States in 1965. In the US, he completed an internship at Cook County Hospital in Chicago and later served his residency at the University of Cincinnati from 1966 to 1969, followed by a one-year fellowship in diagnostic radiology. He went on to serve as assistant professor of radiology at the University of Kentucky before returning to Spain in 1971.

Back in his home country, Prof. Cáceres built up a wealth of clinical and academic experience. He served as head of department and professor in a number of institutions in Madrid, Valladolid and Barcelona. In 1996, he took up the posts of professor of radiology and head of diagnostic radiology at the H.G.U. Vall d'Hebron Autonomous University of Barcelona, where he served until his retirement in 2010.

A valued and distinguished member of the international radiological community, Prof. Cáceres is a member of a number of scientific societies including, the Radiological Society of North America, the Spanish Society of Radiology, the Spanish Society of Thoracic Imaging (SEIT) and the European Society of Thoracic Imaging (ESTI). He has served as president of both ESTI and the SEIT, and at ECR 2011 he delivered the Josef Lissner Honorary Lecture.

Over the course of his career, Prof. Cáceres has published extensively and has 87 peer-reviewed articles, 12 book chapters and a book to his name. He has also served as chest section editor for the *European Journal of Radiology* and editor-in-chief of the Spanish radiological publication, *Radiología.*

Professor José Cáceres from Barcelona, Spain

Friday, March 8, 12:15–13:15, Room A

Gold Medal Awards & Honorary Lecture

Presentation of the ESR Gold Medal Award

José Cáceres; Barcelona/ES

Johannes Lammer; Vienna/AT

Maximilian F. Reiser; Munich/DE

Josef Lissner Honorary Lecture

MR-guided focused ultrasound: a new string to the radiologist's bow

Carlo Catalano; Rome/IT

Alliance for MRI

European Parliament's Employment and Social Affairs Committee's vote clears way for continued patient access to magnetic resonance imaging (MRI)

By Javeni Hemetsberger

The EU Physical Agents Directive 2004/40/EC (EMF Directive) on protecting workers from electromagnetic fields, with an initial national implementation date of 2008, poses a serious threat to the future use of magnetic resonance imaging (MRI). If the limit values laid down in the Directive were applied to MRI, it would prohibit MRI-guided surgery, forbid nurses from remaining with patients during a scanning procedure, and thus deny Europe's patients access to this much needed technology.

Since 2007, the ESR has been actively involved with the EMF Directive, as it is a founding member of the Alliance for MRI, a coalition of patient groups, scientists, the medical community and Members of the European Parliament with the aim of obtaining a derogation for MRI. As a result of the Alliance for MRI's determined efforts, the European Commission published a proposal in 2011 to revise the existing Directive and include a derogation for MRI, which led to prolonged discussions within the European Parliament and Council along with a delay to the implementation deadline of more than five years.

The latest work of the Alliance for MRI included a visit by interested Members of the European Parliament (MEPs) to an MRI facility in Strasbourg in November last year, organised by the Alliance for MRI to educate MEPs on this lifesaving technology. The MRI unit visit went very well with four political parties in attendance. Professor Afshin Gangi, head of radiology and nuclear medicine at the University Hospital of Strasbourg, outlined the safety features and training obligations for MRI workers. All attendees agreed that it was a highly useful and informative visit.

On December 6, 2012 the European Parliament's Employment and Social Affairs (EMPL) Committee's vote demonstrated that the MR unit visit and the Alliance for MRI's continued efforts have paid off.

After almost 10 years of uncertainty, the Employment and Social Affairs Committee (EMPL) took the first step towards ensuring continued patient access to MRI by endorsing the MRI derogation in its adoption of a draft report on the revised Directive 2004/40/EC on electromagnetic fields. The EMPL Committee adopted its draft report on the Directive on electromagnetic fields, including the derogation for MRI, with 39 votes in favour and two abstentions. All relevant amendments were adopted.

The Alliance for MRI views the vote as a positive development as it shows that a majority of the Employment Committee members recognise the importance of MRI for patients in Europe and are willing to take the necessary legislative steps to ensure that this technology remains available to patients today and in the future.

However, it is important to continue the Alliance for MRI's efforts as discussions between the European Commission, the European Parliament and Council continue, and the European Parliament will hold its plenary vote on the EMF Directive in either May or June 2013. All institutions aim to reach a first-reading agreement in 2013.

For more information, please visit www.alliance-for-mri.org

A day to honour women radiologists

ECR Today honours women this Friday, as the world celebrates International Women's Day (IWD), and congratulates prominent women radiologists, who have served as an inspiration for the next generation.

Held annually on March 8, the day aims to raise awareness of women's economic, political and social achievements, as well as the struggles they continue to face. Some countries celebrate the IWD as a public holiday, often by giving flowers to women in a way similar to Mother's Day and Valentine's Day. But the original political and human rights theme designated by the United Nations General Assembly, who declared March 8 the UN day for women's rights and world peace in 1977, still runs strong in many parts of the world.

The first national Women's Day was observed, on February 28, 1909, in the United States, by the Socialist Party of America. A year later, the first International Women's Conference was held during the general meeting of the Socialist Second International in Copenhagen, and the establishment of an annual 'International Woman's Day' was chosen as a strategy to promote equal rights, including suffrage for women. On March 18, 1911, over a million people marched in Austria, Denmark, Germany and Switzerland, demanding that women be given the right to vote and hold public office. They also protested against sex discrimination in employment. Meanwhile, Americans continued to celebrate National Women's Day on the last Sunday in February.

In 1913, Russian women observed their first International Women's Day on the last Sunday in February, according to the Julian calendar used in Russia at the time. In 1917, demonstrations marking the day in Saint Petersburg, which fell on March 8 on the Gregorian calendar, sparked the February Revolution. Women protested against bread shortages, and demonstrations forced Tsar Nicholas II to abdicate on March 15. Following the October revolution, the day became an official holiday in the Soviet Union. It was soon adopted by communist and socialist countries, and Chinese and Spanish communists celebrated it from 1922 and 1936 respectively. The West began celebrating the day after 1977.

Equal rights have progressed almost everywhere since then, and women have gained independence, both politically and economically. Their contribution to the development of medical science grew dramatically over the twentieth century, and they have shaped new disciplines, one of which is radiology. Perhaps the most famous example is Marie Skłodowska-Curie, whose pioneering work on x-ray imaging has inspired generations of scientists worldwide. Curie was also a pioneer in challenging prejudices throughout her career, first as a young woman when she was forbidden to study medicine in her native Poland, and later when she was refused membership to the all-male French Academy of Science, despite becoming the first female Chair at the Sorbonne University in France and earning two Nobel Prizes.

Fortunately scientific societies no longer discriminate against genders. About a third of the European Society of Radiology's members are women, and many hold key positions within the organisation, for instance Professor Birgit Ertl-Wagner from Munich, Germany, the ESR's Education Committee Chairperson. The society's annual meeting, the ECR, has been presided over by three women radiologists so far: Professor Maria Emilia Silvestre from Lisbon, Portugal, in 1987, Professor Helen M.L. Carty from Liverpool, UK, in 2004 and Professor Małgorzata Szczerbo-Trojanowska from Lublin, Poland, in 2010. Prominent women researchers figure among the radiologists recently awarded by the society, including ESR Honorary Members Professor Hedvig Hricak from New York, United States, Professor Theresa McLoud from Boston, United States, Dr. Lizbeth M. Kenny, from Brisbane, Australia, Dr. Kaori Togashi from Kyoto, Japan, along with ESR Gold Medallists Professor Martine Rémy-Jardin from Lille, France, Professor Małgorzata Szczerbo-Trojanowska and Professor Janet E. Husband from London, UK. The ECR has also featured a number of women radiologists as Honorary Lecturers over the years, such as Professor Martine Rémy-Jardin, Professor Christiane K. Kuhl from Bonn, Germany, Professor Hedvig Hricak, Professor Anne Osborn from Salt Lake City, United States, Professor Suzanne E. Anderson from Sydney, Australia, Professor Majda M. Thurnher from Vienna, Austria, and Professor Cornelia Schaefer-Prokop from Amersfoort, the Netherlands. This year, the ECR hopes to welcome at least as many women delegates as it did in 2012, when 41 percent of all medical attendees and 55 percent of student delegates were women.

Marie Skłodowska-Curie

European School of Radiology invests in radiology's future

By Nicholas Gourtsoyiannis, ESOR Scientific/Educational Director

Over the course of its seven years, the European School of Radiology (ESOR) has evolved and established itself as a major provider of radiological education in Europe and the world. It continues to highlight the European Society of Radiology's steadfast commitment and investment in radiological education, while pursuing its two main goals: harmonising radiological education throughout Europe, by supporting the implementation of the European Training Charter, and raising the scientific profile of radiological education worldwide.

The last six years of ESOR have been marked by an outstanding growth in a wide range of modular activities, including visiting schools, seminars, tutorials, scholarships, Teach-the-Teachers courses and exchange programmes for fellows; all of which have so far delivered complementary and continuing education to 10,000 residents and young radiologists. The school has also awarded more than 1,700 course grants and 285 training grants worldwide.

In addition to these impressive numbers, ESOR is proud of having been instrumental in mobilising the resources available for radiological education in Europe and the world, and for creating a long-term educational commitment and structured network – the ESOR community – through partnership. All of these hugely appreciated teaching resources have been provided through the unlimited support of highly esteemed and renowned lecturers, tutors, mentors, volunteer reference training centres, local organisers, subspecialty societies, national societies, academic institutions, and valued industrial partners.

However, ESOR's most valuable partner is undoubtedly you. You are the heart of the ESOR community and I would like to encourage you to actively participate and benefit from its programmes, use the opportunities offered for exchange and interaction, and give or share the knowledge and skills needed to meet tomorrow's requirements.

As radiology has become fundamental to most clinical diagnoses, and central to modern patient care, the vision for radiological education has to be widened. ESOR is already prepared and is ready to respond to any new challenges. I am confident that in the years to come ESOR will maintain its leading role in serving our vibrant community and continue to deliver successfully, connecting the world of radiology.

Friday, March 8, 14:00–15:30, Room Q

ESOR Session

Fostering future researchers

Moderators: N. Gourtsoyiannis; Athens/GR
G.P. Krestin; Rotterdam/NL

- **Introduction**
  G.P. Krestin; Rotterdam/NL
- **ESOR in action 2013**
  N. Gourtsoyiannis; Athens/GR
- **Research training for residents**
  L. Martí-Bonmatí; Valencia/ES
- **PhD in residency programmes**
  S. Trattnig; Vienna/AT
- **Preparing research trials**
  R.G.H. Beets-Tan; Maastricht/NL
- **Awards**

During the session, scholars and fellows will be awarded certificates for successfully completing the 2012 ESOR Scholarship and Fellowship Programmes.

We proudly present the scholars and fellows 2012

Scholarship Programme 2012 in Europe

Ana Andrés Paz, Santander, Spain
Svetlana Balyasnikova, Moscow, Russia
Helena Esteban Cuesta, Zaragoza, Spain
Rodrigo de Carvalho Flamini, Recife, Brazil
Emilia Frankowska, Warsaw, Poland
Mario Fusari, Napoli, Italy
Seyedmohammadali Hamedshamaee, Mashhad, Iran
Silvia Tomas Hernandez, Birmingham, UK
Adrian Hrusca, Cluj Napoca, Romania
Na Hu, Chengdu, China
Yasir Jamil Khattak, Karachi, Pakistan
Chrysafoula Kolofousi, Athens, Greece
Slavka Kudrnova, Budapest, Hungary
Patricio Maximiliano Latorre Brajovic, Santiago, Chile
Napoleón Gabriel Macías, Barcelona, Spain
Claudio Mattiello, Napoli, Italy
Caterina Michelozzi, Milano, Italy
Felipe Costa Moreira, Guaratingueta, Brazil
Gyula György Naszádos, Budapest, Hungary
Sibusiso Ndlovu, Centurion, South Africa
Aikaterini Ntailiani, Iraklion, Greece
Fernanda Sachetto Pimenta, Ipatinga, Brazil
Irina Popescu, Bucharest, Romania
Nitin Ramamurthy, Manchester, UK
Victor Rodriguez Laval, Madrid, Spain
Catarina Fontes Ruivo, Coimbra, Portugal
Tarvo Sillat, Tallinn, Estonia
Philipp Steiger, Bern, Switzerland
Richard Erasto Sungura, Arusha, Tanzania
David Laszlo Tarnoki, Budapest, Hungary
Ashlesha Satish Udare, Mumbai, India
Fulvio Zaccagna, Rome, Italy
Lei Zhao, Beijing, China
Anandapadmanabhan Jayajothi, Tbilisi, Georgia

Scholarship Programme 2012 in the USA

Manos Astrinakis, Alexandroupolis, Greece
(Case Western Scholarship Programme)
Elena Ilieva, Sofia, Bulgaria
(Case Western Scholarship Programme)
Chiara Marigliano, Rome, Italy
(MSKCC Scholarship Programme)
Derya Yakar, Nujmegen, the Netherlands
(MSKCC Scholarship Programme)

Exchange Programme for Abdominal Imaging Fellowship 2012 (in partnership with ESGAR)

Gerardo Dessi, La Spezia, Italy
Mykhailo Liubchak, Plyuty Village, Ukraine
Dipanjali Mondal, Oxford, UK
Isabel Cristina Tavares, Oporto, Portugal
Ozum Tuncyurek, Aydin, Turkey

Exchange Programme for Breast Imaging Fellowship 2012 (in partnership with EUSOBI)

Mariliis Soonsein, Tallinn, Estonia
Efthymia Syristatidou, Athens, Greece

Exchange Programme for Breast Imaging Fellowship 2012 (in partnership with the MSKCC)

Chiara Iacconi, Pisa, Italy

Exchange Programme for Cardiac Imaging Fellowship 2012 (in partnership with the ESCR)

Ezequiel Levy Yeyati, Buenos Aires, Argentina
Beatriz Nieto, Vigo, Spain

Exchange Programme for Chest Imaging Fellowship 2012 (in partnership with ESTI)

Gianluca Argentieri, Lugano, Switzerland
Wagner Diniz de Paula, Brasília, Brazil
Dariusz Slusarczyk, Lund, Sweden

Exchange Programme for Head and Neck Imaging Fellowship 2012 (in partnership with the ESHNR)

Chi-Tuan Pham, Corbeil-Essonnes, France
Jasmina Plascak, Zagreb, Croatia

Exchange Programme for Neuroradiology Fellowship 2012 (in partnership with the ESNR)

Ronald Antulov, Rijeka, Croatia
Yin Liu, Changsha, China
Gretel Santana Rondon, La Habana, Cuba
Paramdeep Singh, Faridkot, India
Eirini Vrentzou, Athens, Greece

Exchange Programme for Paediatric Radiology Fellowship 2012 (in partnership with ESPR)

Emmanouil Amanakis, Rethymno, Greece
Maria Covadonga Garcia Morilla, Barcelona, Spain
Persefoni Margariti, Ioannina, Greece
Fuldem Mutlu Aygun, Konya, Turkey

The certificates will be awarded today during the ESOR session.

Royal College prepares for busy year

By Peter Cavanagh

As ever, there are many challenges and successes' facing the radiological community in the UK and the Royal College of Radiologists (RCR) has been at the forefront of many of these. Perhaps one of the most pressing is the workload facing clinical radiologists. This continues to increase year on year, placing pressure on services to be more efficient while improving the quality. By leading and supporting clinical radiologists across the UK, the RCR will continue to tackle this issue, which feeds into many other developments, a few of which are outlined below.

Radiology workforce

Following a strong case by the RCR, made possible by our detailed workforce census data, UK training numbers are being expanded to meet the demand for imaging services. The planning guidance is for an extra 30 places per annum for the next three years. When many other specialties are having their numbers frozen this is a great success for radiology and reinforces the importance of the specialty. The major challenge that we now face is that these posts bring no additional funding. We anticipate that funding from contracting specialties will be available and the RCR will continue to advance the development of the workforce.

Revalidation

Revalidation formally commenced across the UK on December 3, 2012 and the first tranche of non-medical leader doctors will begin in April 2013. All doctors who wish to maintain a GMC license must undergo revalidation. This will be a major new responsibility for clinicians in the UK. The two main components, timescales and requirements, are set by the General Medical Council (GMC) but the RCR has a key support role. The College has created a range of online tools and templates and a helpdesk to provide specialty advice for Fellows and members as they undergo the process, as well as an advanced system to record their continuing professional development information, which will feed into revalidation. Whilst this is a significant undertaking for both individual doctors and the Royal Colleges, the well-being of patients must be at the forefront of these initiatives and we know that the rest of the medical world will be watching with interest.

Teleradiology

Increased demand for imaging, financial pressure and changes to the NHS have given rise to a new breed of medical practice in the UK, and teleradiology companies are a growing issue on the RCR's agenda as overseas teleradiologists do not need to be on the GMC register or have a license to practise in the UK. The RCR believes that UK patients have the right to expect that all doctors involved in their care are regulated to the same standard, irrespective of where they are based. The College is in discussion with the Department of Health, GMC and the Care Quality Commission and steps have been set out to address this; but to ensure that all doctors who practise on UK patients are uniformly regulated legislative change is needed. The RCR will continue to pursue these discussions over the coming year.

Molecular imaging

Molecular imaging is beginning to have a crucial role in more accurate diagnosis, staging of the extent and location of disease, assessment of potential therapeutic targets and providing prognostic information specific to individual patients. As the organisation that sets the standards for radiology training and clinical practice, the RCR's role is central.

The current clinical radiology curriculum provides no formal training structure for many of these newer techniques and technologies, so we are working to define how best to incorporate these new requirements. We believe this should be based on the firm foundation of the current training curriculum in clinical radiology in the UK, led by the RCR, and that the time has come to put more focus on molecular imaging in preconsultant specialty training. Initially, the number of those training in molecular imaging is expected to be small and taken from the existing trainee establishment. As translational research becomes clinical practice, we must harness the opportunity to produce imagers suitably trained in the new techniques as they emerge, not after the event as we saw with the clinical introduction of PET-CT, and before that with the emergence of clinical MRI.

Delivery of the new techniques in clinical practice will involve close cooperation with colleagues in nuclear medicine, clinical science, medical physics, and molecular therapy, and an RCR working group is now reviewing the position of molecular imaging in training and will make recommendations on its implementation.

Dr. Peter Cavanagh from Taunton, UK, is Dean of the Faculty of Clinical Radiology.

More information about the Royal College of Radiologists can be found at www.rcr.ac.uk

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Rising Stars Programme

Basic Sessions

Friday, March 8, 08:30–10:00, Studio 2013

Basic Session on Cardiac Radiology

- **Imaging of myocardial infarction and viability**
  M. Francone; Rome/IT
- **Acute aortic syndrome**
  A.J.B.S. Madureira; Porto/PT
- **Cardiac CT in the Workup of Coronary Heart Disease**
  U.J. Schoepf; Charleston, SC/US

Friday, March 8, 10:30–12:00, Studio 2013

Basic Session on Neuroradiology

- **Aging, degeneration, and inflammation in the brain: an imaging perspective**
  B. Gómez-Ansón; Barcelona/ES
- **Is the Circle of Willis a circle?**
  H.R. Jäger; London/UK
- **CNS Infections**
  M.M. Thurnher; Vienna/AT

Student Sessions

Friday, March 8, 14:00–15:30, Studio 2013

Student Session 1

- **Provisional reporting – maintaining high standards in radiology**
  F. Seker; Mannheim/DE
- **Provisional reporting – radiology versus emergency doctors**
  R. Coroiu; Covasna/RO
- **Provisional reporting – The key for diagnosis of poly-trauma patients**
  J. Lee; Seoul/KR
- **With the patient; let us establish a rapport**
  K. Song; Seoul/KR
- **Theory and practice in medical education**
  M. Aleksandrova-Moiseja; Riga/LV

Friday, March 8, 16:00–17:30, Studio 2013

Student Session 2

- **Theory vs. practice**
  V. Nechaev; Moscow/RU
- **Radiographer students' role in large-scale research projects of the European community: my educational perspective**
  Z. Demeter; Nyíregyháza/HU
- **Theory and practice – supposed dichotomy – exemplifying the practical role of MRI in diagnosing knee injuries**
  C.G. Iacoban; Baia Mare/RO
- **MRI contrast agents: what radiographers-in-training need to know**
  C. Fraga Piñeiro; Vigo/ES
- **Pratice through stimulation**
  M. Breikss; Riga/LV

Student Hands-on Workshops on Ultrasound In cooperation with Sono4You

After last year's success, hands-on workshops exclusively for students will again be held at ECR 2013.
An expert team of tutors will lead the students through the workshops, which will include six different workstations to give every participant the chance to familiarise themselves with the wide range of possibilities with ultrasound.

- **Workshop 1:**
  Friday, March 8, 10:00–12:00
- **Workshop 2:**
  Friday, March 8, 14:00–16:00
- **Workshop 3:**
  Saturday, March 9, 16:00–18:00
- **Workshop Advanced:**
  Sunday, March 10, 16:00–18:00

Suitable for advanced students and residents.
All workshops take place in Room X (1st level).

Registration:
These workshops are fully booked. Places may become available at short notice onsite.

ESPR continues to improve paediatric care

By Catherine Owens

The European Society of Paediatric Radiology is a non-profit, secular society for practitioners of paediatric imaging or image-guided intervention, or those who have a particular interest therein. We aim for clinical excellence in the care of children and are committed to developing best practice globally. The ESPR has 277 members and many associate members.

The ESPR aims to:

- Contribute to the development of paediatric imaging
- Create and promote excellence within paediatric imaging
- Initiate, drive forward and create excellence in paediatric imaging and radiation protection research
- Ensure optimal radiation protection for children based on the principles of justification and optimisation
- Enhance ties with other radiology and paediatric organisations and global institutions whose goals reflect those of the ESPR
- Promote new developments within the field
- Draw together committed individuals to enhance the dynamic and convivial paediatric radiology community

This year at ECR 2013 we have our usual Categorical and Refresher Courses, including two Special Focus Sessions; 'Justifying CT in paediatric radiology' on Friday morning and 'My most beautiful mistakes in paediatric radiology' on Monday morning. A Foundation Course session is dedicated to paediatric neuroimaging.

The ESPR has five task forces

Child abuse: addresses the current shortfalls in evidence-based guidelines and expertise in this high profile, difficult medical and social malady.

CT & dose: addresses the topical, complex issues involved in CT radiation protection and dose measurements and aims to coordinate protocols, guidelines, phantom availability and measurements within paediatric CT whilst encouraging cooperation with international societies.

Genitouroradiology: liaises with ESUR to produce guidelines and numerous publications on best practice for paediatric GU imaging.

Musculoskeletal radiology: addresses and standardises the value of screening DDH for assessing long-term outcomes and imaging in JIA.

Neuroradiology: a joint venture between the ESPR, ESNR and ESMRN, it coordinates and encourages joint efforts to develop guidelines.

The ESPR achieves its **research** aims through multicentre projects, cooperation with global institutions and joint ventures conducted with the industry. The **European Excellence Network on Paediatric Radiology Research**, led by Professor Karen Rosendahl and Erich Sorantin, was set up to this end, and some five research projects are currently underway. The ESPR became a shareholder of EIBIR in 2011.

The World Federation of Paediatric Imaging (WFPI)

In 2011, the ESPR united with its sister societies to launch the WFPI, a world initiative aiming to address global barriers to optimal paediatric imaging and promote education, best practice and appropriate imaging guidelines for the benefit of children worldwide, particularly those in developing or war-torn areas.

The journal Pediatric Radiology

Our journal updates readers on all areas within paediatric imaging and related fields through a blend of original papers and reviews, presenting knowledge within particular subspecialties and summarising specific topics. Advances in technology, methodology, apparatus and equipment are explored. The journal is shared with the ESPR's regional sister societies, the SPR, AOSPR and SLARP. Impact Factor: 1.7 (2011). European editor: Professor Guy Sebag, European sub-editors: Drs. Øystein Olsen and Annie Patterson.

The ESPR's website, www.espr.org, offers information on the official journal, as well as news and updates on forthcoming events, task forces and external ties. ESPR members also have access to the journal and a membership directory. In addition grants are available for junior radiologists. Visit the site via the QR code below:

The ESPR's 50th Annual Meeting and 36th Postgraduate Course will be held in Budapest, Hungary, June 3–7.

Annual ESPR Meetings

The 20th ECPR, organised by Doctor Maarten Lequin and focusing on cardiothoracic imaging, will be held in Rotterdam, the Netherlands, on October 3–5, 2013.

The ESPR's 50th Annual Meeting and 36th Postgraduate Course will be held in Budapest, Hungary, June 3–7. The meeting venue is the Marriott Hotel, and our annual president is Doctor Éva Kis.

The postgraduate course will take place June 3–4. Leading international speakers in paediatrics will deliver state-of-the-art lectures in cardiothoracic, gastrointestinal, urogenital, musculoskeletal, oncological, and neuroimaging. Trauma imaging and ongoing developments in imaging methods will be presented.

The two-day course will be followed by the three-day 50th Annual ESPR Scientific Meeting, with lectures and posters from all fields of paediatric radiology. The task forces on uroradiology, child abuse, oncology, neuroradiology, radiation dose and MSK radiology will ensure that there is something on the programme for everyone to enjoy.

More information on the ESPR can be found at www.espr2013.org

Professor Catherine Owens from London, UK, is the ESPR General Secretary.

Meet & Greet at the Rising Stars Lounge

Meet & Greet with your RTF Representative

Don't miss the opportunity to get in touch with your national RTF representative during the ECR! Visit the RTF Meeting Point in the Rising Stars Lounge (Foyer B, 2nd Level) where resident representatives from various countries will be available daily from 13:15 to 13:45 to provide you with first-hand information.

ESR and ECR Presidents and ESOR Scientific/Educational Director in the Rising Stars Lounge

Take the unique chance to meet and greet the ESR and ECR Presidents, as well as the ESOR Scientific/Educational Director, in the Rising Stars Lounge during the ECR.

Friday, March 8, 13:00–13:15
Prof. Nicholas Gourtsoyiannis (Greece)
ESOR Scientific/Educational Director

Saturday, March 9, 15:40–16:00
Prof. José I. Bilbao (Spain)
ECR Congress President

Sunday, March 10, 12:45–13:05
Prof. Gabriel P. Krestin (Netherlands)
ESR President

What's on today in Vienna?

Theatre & Dance

Please note that all performances are in German.

In 80 Tagen um die Welt by Jules Verne © Reinhard Werner / Burgtheater

Akademietheater

1030 Vienna, Lisztstraße 1
Phone: +43 1 51444 4145
www.burgtheater.at

19:30 **räuber.schulden.genital** by Ewald Palmetshofer

Burgtheater

1010 Vienna, Dr. Karl-Lueger-Ring 2
Phone: +43 1 51444 4145
www.burgtheater.at

16:00 **In 80 Tagen um die Welt** by Jules Verne

Schauspielhaus

1090 Vienna, Porzellangasse 19
Phone: + 43 1 317 01 01
www.schauspielhaus.at

20:00 **Der Geizige – Ein Familiengemälde nach Molière** by PeterLicht

Theater Drachengasse

1010 Wien, Fleischmarkt 22
Phone: + 43 1 513 14 44
www.drachengasse.at

20:00 **Das normale Leben** by Christian Lollike

Theater in der Josefstadt

1080 Vienna, Josefstädter Straße 26
Phone: +43 1 42 700 300
www.josefstadt.org

19:30 **Hedda Gabler** by Henrik Ibsen

Concerts & Sounds

Zubin Mehta © www.flonthego.com

Musikverein (Classical Music)

1010 Vienna, Bösendorferstrasse 12
www.musikverein.at

15:30 **Wiener Philharmoniker,** conductor **Zubin Mehta** A. Bruckner

Porgy & Bess (Jazz)

1010 Vienna, Riemergasse 11
www.porgy.at

20:30 **Vogelperspektive** (A/FIN/D)

Arena (Alternative Music)

1030 Vienna, Baumgasse 80
www.arena.co.at

19:00 **Born of Osiris** (US) + **After the Burial** (US)

Gasometer (Alternative Music)

BA-CA Halle Gasometer
1110 Vienna, Guglgasse 8
www.planet.tt

20:00 **Nelly Furtado**

Szene Wien (Alternative Music)

1110 Vienna, Hauffgasse 26
www.szenewien.com

20:00 **Walk the Moon**

Opera & Musical Theatre

Celso Albelo and Chen Reiss in **L'Elisir d'Amore** by Gaetano Donizetti © Wiener Staatsoper / Michael Pöhn

Volksoper

1090 Vienna, Währingerstraße 78
www.volksoper.at

19:00 **Die Fledermaus** by Johann Strauß

Wiener Staatsoper – Vienna State Opera

1010 Vienna, Opernring 2
www.wiener-staatsoper.at

19:30 **L'Elisir d'Amore** by Gaetano Donizetti, conducted by Yves Abel
With Ailyn Pérez, Stephen Costello, Markus Werba, Lorenzo Regazzo

Raimundtheater

1060 Vienna, Wallgasse 18–20
www.musicalvienna.at

19:30 **Elisabeth** by Michael Kunze & Sylvester Levay

Ronacher

1010 Vienna, Seilerstätte 9
www.musicalvienna.at

19:30 **Natürlich Blond** by Laurence O'Keefe, Nell Benjamin & Heather Hach